

CA1
Z 1
-74M21

(5)

Government
Publications

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF APPLICATIONS BY EACH OF

- (a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE YUKON TERRITORY AND THE NORTHWEST TERRITORIES; and
- (b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS CROWN LANDS WITHIN THE NORTHWEST TERRITORIES,

FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION, OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE PROPOSED PIPELINES

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

September 16th 1975

PROCEEDINGS AT INQUIRY

Volume 62

F R R A T A


1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Volume 55 should correctly be numbered from page
7589 consecutively through to 7666-7800

Volume 61 Exhibit 237 should be
First Year Cost of Service vs
Flow Rate Comparison 48" and
36" @ 24,000 H.P.
Exhibit 238 should be
First Year Cost of Service vs
Flow Rate 42" @ 24,000 H.P.
different pressures

347
M835
Vol. 62

CANADIAN ARCTIC
GAS STUDY LTD.
SEP 23 1975
LIBRARY



Digitized by the Internet Archive
in 2022 with funding from
University of Toronto

<https://archive.org/details/31761114677164>



APPEARANCES:

Mr. Ian G. Scott, Q.C.
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley
Pipeline Inquiry;

Mr. Jack Marshall,
Mr. Darryl Carter, and
Mr. John Steeves for Canadian Arctic Gas
Pipeline Limited;

Mr. Reginald Gibbs, Q.C.
Mr. Alan Hollingworth for Foothills Pipelines
Ltd.;

Mr. Russell Anthony,
Prof, Alastair Lucas for Canadian Arctic
Resources Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton for Northwest Territories
Indian Brotherhood and
Metis Association of the
Northwest Territories;

Mr. John Bayly for Inuit Tapirisat of
Canada and the
committee for Original
Peoples Entitlement;

Mr. Ron Veale and
Mr. Allen Lueck for the council for the
Yukon Indians

Mr. Carson H. Templeton for Environment Protect-
ion Board;

Mr. David Reesor for Northwest Territories
Association of Muni-
cipalities

Mr. Murray Sigler for Northwest Territories
Chamber of Commerce

CANADIAN ARCTIC
GAS STUDY LTD.

SEP 23 1975

LIBRARY

I N D E X

	Page
1	
2	<u>WITNESSES FOR FOOTHILLS PIPE LINES LTD:</u>
3	
4	E.A. MIROSH
5	A.F. BAUER
6	G.W. WALKER
7	P.G. GLOCKNER
8	- Cross Examination by Mr. Marshall Cont'd 8762-8882
9	Cross Examination by Mr. Bayly 8789
10	Cross Examination by Mr. Bell 8823
11	Cross Examination by Mr. Scott 8829
12	Re-Examination 8882
13	
14	E.A. MITÓSH
15	
16	W.R. SCRIMES
17	
18	Direct Examination 8888
19	Cross Examination by Mr. Carter 8903
20	Cross Examination by Mr. Bell 8941
21	Cross Examination by Mr. Bayly 8947
22	Cross Examination by Mr. Scott 8958
23	
24	
25	
26	
27	
28	
29	
30	

Yellowknife, N.W.T.

September 17, 1975

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GIBBS: Mr. Commissioner, could I speak momentarily to the sequence of panels today. Unexpected to me at least, time restraints, self-imposed I presume by my friends Mr. Marshall and Mr. Scott have led us to proceed more quickly than we anticipated. We expect that, and I hope those persist today. We expect that we will be ready to proceed with the next panel, communications, when this one is finished. The witness for that panel is due to arrive any moment and may already have done so, but it may be necessary to ask for ten or 15 minutes if his plane is late. We will then go to compressor station design. The panel after that is metallurgy. I don't yet know whether we will be ready to proceed with that, again because of plane times, if we reach that point by noon. If not, we will go ahead with geotechnical in its place. Later this morning, whichever one of those we put on, because we may not have those people here till one, I may have to ask that we start after lunch at two, instead of one, but I will keep you sir and my friends, informed as we have further timing bulletins this morning.

F.A. MIROSH: Resumed

A.F. BAUER: Resumed

G.W. WALKER: Resumed

P.G. GLOCKNER: Resumed

MR. MARSHALL: Thank you sir.

CROSS-EXAMINATION BY MR. MARSHALL CONTINUED:

1 Q Mr. Mirosh, could you tell
2 me if the criteria that have been developed by Dr.
3 Glockner for the allowable displacement of the pipe
4 as presented in his evidence and Exhibits 239 to
5 244 inclusive, have been accepted and adopted by
6 Foothills for use in determining pipeline design?

7 WITNESS MIROSH:

8 A Sir, this information
9 has been developed over the last few months. It's at
10 a stage where we have not completely reviewed it with
11 Dr. Glockner so I would say that we haven't reached
12 that stage yet.

13 Q Do I take it that you
14 haven't decided whether you accept it or you don't
15 accept it?

16 A Well quite frankly,
17 preparing for the hearings, we haven't had time to
18 look at this material in detail with Dr. Glockner.

19 Q But it's been presented as
20 part of your design panel's evidence.

21 A That's correct.

22 Q What weight or consideration
23 are we to give it then, if you haven't yet had an
24 opportunity to look at it and decide whether or not you're
25 going to make use of it?

26 A Well it's like everything
27 else that is a final design criteria, these are approaches
28 that we certainly adopt, as to whether the numerical
29 results are correct, we're not certain yet, we haven't
30 reviewed these in detail.

1 Q When do you expect that
2 you're going to have had an opportunity to make the
3 review of Exhibits 239 and 240, 241, 242 and so on to
4 244?

5 A Well these are being
6 reviewed continually by our staff because they are
7 working with Dr. Glockner. As to further reviews, we'll
8 be doing these in the next few weeks.

9 Q Has Foothills done any
10 work to check out the application of the formulae that
11 have been presented to work through various values to
12 their applicability.

13 A Yes, of course. In fact,
14 Foothills engineers are doing most of the calculations.

15 Q Well, do I take it then
16 that you consider the approach that has been taken to
17 be a sound one?

18 A Yes, we agree with the
19 approach.

20 Q I suggest to you sir that
21 with a criteria as rigid as those that were presented by
22 Dr. Glockner in his evidence and I refer you specifically
23 to the example that I endeavoured to work through, using
24 his charts, these exhibits I have just referred to, last
25 night, which would limit the allowable deflection to
26 less than three inches over a 200 foot length of pipe,
27 that with such criteria, it is not possible for a buried
28 pipeline to be installed, in such a way that the criteria
29 would be met. Do you agree with that?

30 A Well I might just point out

1 that these graphs as Dr. Glockner points out were based
2 on a 20 percent SMYS calculation. This no where near
3 approaches the point where the pipeline would fail.
4 This is an arbitrary assignment at this time. This may
5 change.

6 Q Well, do you have an
7 opinion as to whether or not use and application of the
8 20 percent SMYS figure is workable in the design of the
9 Foothills pipeline?

10 A Well it's extremely
11 conservative.

12 THE COMMISSIONER: Do you
13 say it may be unduly conservative.

14 A Yes sir.

15 MR. MARSHALL:

16 Q What do you think might
17 be a more reasonable figure to use in your design?

18 A I'm not certain at this
19 stage.

20 Q Well at what point in
21 the process does Foothills think or expect that it
22 will know what criteria to apply to this important
23 aspect of pipeline design. When are you going to be
24 at the point?

25 A Well this will be a con-
26 tinuing subject to study and over the next few months
27 we'll be approaching the point where we'll be able to
28 make a decision on that.

29 Q So you expect to be able to
30 make a decision sometime after the next few months?

1 A Of course, subject to
2 further revision as we find more information out.

3 Q Mr. Mirosh in your
4 evidence in addressing differences in pipeline design
5 between the Arctic Gas and Foothills projects, you comment
6 that one of the differences is with respect to the
7 CAGSL proposal to use 120 foot right of way and
8 Foothills proposes to use a 60 foot right of way with
9 a 60 foot working surface. My question is sir,
10 whether or not Foothills would propose to clear the
11 entire 60 foot right of way and 60 foot working surface
12 for construction purposes?

13 A Well I think that there's
14 no question the 60 foot right of way would have to be
15 cleared. As to whether the 60 foot working space would
16 be cleared, this has been a subject of some discussion.
17 Certainly most of it would have to be cleared, depending
18 on the slope conditions, it may be that the entire 60
19 feet would have to be cleared, or less.

20 Q Well if you needed it for
21 a working surface, you would have to clear it, isn't that
22 -- doesn't that follow?

23 A Yes, except we might get
24 away with 40 feet in some places, additional, instead of
25 the 60 feet.

26 Q So then once the con-
27 struction had been completed, you would cease using
28 this working surface and you would be left with your
29 60 foot right of way?

30 A Yes.

1 Q And presumably then the
2 payment for use of the land would be restricted then
3 to the 60 foot right of way rather than the 120 foot
4 area that would have been cleared?

5 A Yes.

6 Q Now sir, on page two in
7 answer four, you speak about the -- at the near bottom
8 of the page, you say,

9 "The subsurface soil
10 information is currently being obtained from drill hole
11 data which has been made available by the Alberta Gas
12 Trunk Line."

13 I take it that that would be
14 information that Alberta Gas Trunk Line Limited would
15 have acquired as part of the study group?

16 A Yes sir.

17 Q Also on that page sir,
18 just three lines above that, you speak of mathematically
19 modelling the pipe and also on page 7 of your evidence
20 you speak of a geothermal model or geothermal models.
21 I was wondering sir, who is doing the mathematical
22 modelling of the pipe for Foothills?

23 A We have hired a consulting
24 firm to help us along with this. G.W. Brucker and
25 Associates of Edmonton, along with Foothills staff.

26 Q Can you tell me sir if
27 the model being used is based on the Battele-Brooker
28 model?

29 A The model being used is
30 based on an early model which Brooker, the Brooker firm

1 had developed and which CaGsl had used, yes.
2 But whether that's the same as the one you refer to,
3 I'm not certain.

4 Q You don't know whether or
5 not there are any differences in the programs between
6 the Battelle-Brooker model developed for Arctic Gas over
7 a number of years and the model that Brooker is currently
8 employing for Foothills?

9 A Yes, there are some
10 differences. There have been refinements which the
11 Brooker firm has been adding at our request to allow
12 the calculation of the effects of water movement on the
13 geothermal model.

14 Q Could you provide me
15 with any particulars of the refinements that have been
16 made to the model. I'm particularly interested in
17 the newly acquired capabilities that the model would
18 now have with these refinements, compared with its
19 capabilities before these refinements were initiated,
20 at Foothills request.

21 A As to the detail, I would
22 prefer to leave that to the geotechnical panel who will
23 have a member of the Brooker firm on it, and that will
24 be his aim, to discuss the geothermal aspects.

25 Q Do I take it that you're
26 not knowledgeable about that subject?

27 A Only in the sense that
28 I'm advised of what is happening, but as to the details
29 of the model, I'm not expert.

30 Q You've mentioned a refinement

1 in one area relating to water. Are there other refinements
2 that you're aware of you can discuss in general terms?
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Mirosh, Walker, Bauer, Glockner
Cross-exam by Mr. Marshall

1 A. Well the primary refinement is
2 that of water, I'm not aware of any other significant
3 modifications to that model but we are using a second
4 model as well in addition to the Brooker model as a
5 cross check. This is a model developed by a Dr. Coulter
6 at Kingston Royal Military College. It's a model, it's
7 a mathematical model which uses a slightly different
8 mathematical technique and we are generating the same
9 type of information with that model, except that that
10 model does not have the capability of taking into account
11 water migration.

12 Q Have reports or studies
13 been produced as a result of the employment of these
14 two models that you spoke of?

15 A We have interim reports on
16 both models, yes.

17 Q Might those be made
18 available?

19 A If counsel advises that
20 that can be.

21 MR. GIBBS: All right, I pre-
22 sume if the interim reports are of some use we can make
23 them available. It would seem to me that the final
24 report would be the conclusive one, and may well, I take
25 it, Mr. Mirosh, change from the interim.

26 A Yes, the models are being
27 refined at the present time.

28 MR. MARSHALL:

29 Q It would be useful, I
30 think, to have the interim reports given that were

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 attempting to deal with the geotechnical evidence of
2 Foothills now and the final reports may be sometime off
3 in coming.

4 MR. GIBBS: Well we will pro-
5 duce the interim reports. I'm giving no undertaking
6 about when we can deliver them here. I don't know
7 whether we'll get them here by the time the geotechnical
8 panel is on, I doubt it, but we will see what we can do.

9 MR. MARSHALL:

10 Q Mr. Mirosh, on page 3 of
11 your prepared evidence, you deal with design steps
12 which would limit pipe movement due to frost heave.
13 The second technique is water drainage from the ditch.
14 Do you have any studies to determine how effective the
15 drainage of water after the first year of operation
16 would be?

17 A No, sir.

18 Q I'm instructed, sir, that
19 in fact after even a few days, all the water in these
20 -- all the water would have frozen and it would be
21 impractical really to drain the water from the ditch.
22 Do you agree or disagree with that?

23 A Yes, in the winter time
24 that would probably be true. I'm not sure about the
25 summer time.

26 Q Are you proposing to put
27 in any pipe during the summer?

28 A No, but there would be
29 pipe necessarily in the ditch not operational during the
30 summer after the first year's winter construction.

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 Q The third technique
2 specified is insulation around the pipeline, sir. Do
3 you intend that the insulation will prevent the soil
4 from heaving? I'm sorry, do you intend that the insulat-
5 ion will prevent the soil from freezing?

6 A No --

7 Q Do you intend to have
8 that degree of insulation around the pipe?

9 A No, not necessarily.
10 This is a technique that might be used under water
11 courses, but certainly the rate of freezing is slowed
12 down by insulation. Over the long term, insulation
13 would probably not affect the overall growth of the bulb.

14 Q That was really the point
15 I was getting to. My information is that beyond the
16 relatively short period of time, insulation will have
17 very limited effect, and you have reached the same
18 conclusion?

19 A I think that would be a
20 true conclusion.

21 Q The fifth technique is
22 pipe restraining saddles with frost anchors. Aren't
23 frost anchors only of use in soil that is already frozen?

24 A Well I understand that
25 the National Research Council and CAGSL in fact have
26 done some work on frost anchors both in frozen and in
27 unfrozen soil, and providing that the soil has some
28 rigidity to it, even if it's unfrozen, I believe that
29 cement in use instead of a slurry to stabilize the
30 anchor could be applica ble.

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 Q Now is this belief that
2 you have expressed, based upon some studies that Foot-
3 hills has had done?

4 A Based only upon a liter-
5 ature survey.

6 Q Have you any information
7 on the size of anchor that's needed to inhibit heave
8 in unfrozen soil?

9 A There is data available
10 and again from the literature material we have looked at,
11 but I don't recall the specifics.

12 Q In reviewing the various
13 differences between the two projects, one you make
14 reference to is that Foothills does not propose to have
15 block valves at locations between its compressor
16 stations. I was wondering, sir, what studies you had
17 used in determining that it is not necessary or advis-
18 able to place block valves between stations? What's
19 the basis of this decision?

20 A Well, it's one which I
21 have tried to outline in my direct testimony which is
22 more a philosophical point of view. We do have studies
23 as well, but the fact that we don't feel there will be
24 third party damage, which is the major cause to most
25 pipelines in the Northwest Territories -- let me re-
26 phrase that.

27 The fact that we do not feel
28 there will be third party damage to a pipeline in the
29 Northwest Territories makes us feel that intermediate
30 block valves are not necessary for this particular

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 pipeline, and as I pointed out in my direct, statistics
2 show that third party damage is a major cause of dis-
3 ruption to pipelines, and intermediate block valves
4 serve one of their functions, probably their primary
5 function is to serve as a closure device in the event
6 of a pipeline rupture. Using that rationale, we felt
7 that they are not really necessary if that is the primary
8 reason for installing them, coupled with the fact that
9 they would be in inaccessible locations and would
10 require effort to maintain.

11 Q Well in essence it's a
12 judgment call based on the experience of Alberta Gas
13 Trunk Lines and the people at Foothills' accumulative
14 experience?

15 A Yes.

16 THE COM MISSIONER: What would
17 the saving be in the capital cost of the system, owing
18 to the elimination of intermediate block valves?

19 A Well sir, off the top of
20 my head I would probably say we are talking about a
21 million dollars at each block valve location, in terms
22 of capital cost.

23 THE COMMISSIONER: You said
24 you eliminated one -- or at least you didn't include
25 one intermediate block valve between --

26 A Yes.

27 THE COMMISSIONER: -- compressor
28 stations?

29 A Yes, that would be the
30 elimination of some 17 valves, I believe.

Mirosh, Bauer, Walker, Glockner
Cross-Exam by Mr. Marshall

1 MR. MARSHALL:

2 Q Mr. Bauer, I have really
3 one question for you only. We have not been able to
4 find in the Foothills' materials, a statement as to the
5 number of weights and the sizes of the weights, and I
6 was wondering if we have simply overlooked it, or whether
7 it's not there or whether we can find it in some other
8 -- at some other source.

9 THE COMMISSIONER: You mean
10 the saddle --

11 MR. MARSHALL: Yes, sir.

12 Q Do you have some inform-
13 ation on that?

14 MR. BAUER:

15 A We have some tentative
16 studies made on weights, primarily concrete saddle
17 weights, approximately 10,000 pounds each. The spacing
18 naturally has to be determined subject to detailed
19 sub-soil investigations.

20 Q What estimates have you
21 arrived at, albeit tentatively? As to the numbers
22 that would be required?

23 A We did not arrive at any
24 conclusive estimates, it was strictly based on the
25 very limited field information we have so far on hand.

26 Q How then did you go about
27 preparing cost estimates for the construction plan if
28 you didn't have any figures on the numbers and quantities
29 of weights?

30 A We allowed about,

1 approximately 50 percent of the total length to be
2 counter-weighted.

3 Q With the 10,000 pound
4 weights?

5 A Yes.

6 Q And that's the estimate
7 that's been used to prepare the logistics cost estimates
8 and construction cost estimates incorporated into the
9 construction budget?

10 A That is correct, yes.

11 Q Mr. Walker, turning to
12 your answer to question 17 on page 14 of the panel's
13 evidence, I note that in dealing with the factors con-
14 sidered in river crossing design, your answer uses the
15 phrases, like in line 3 "will give", and line 7, "will
16 also be used", line 15 "will be utilized to complete",
17 and am I correct in assuming that you're talking about
18 things that will be done, rather than things that have
19 been done?

20 MR. WALKER:

21 A Both.

22 Q Well, it was a little
23 unclear to me from your answer to 17, because it seemed
24 that you talk in the future and then over on page 15
25 you talk, to some extent, about what has happened
26 already. Could you just more clearly go through that
27 and explain exactly what has been done and what remains
28 to be done?

29 A Well at this stage in
30 development of the project, the data that is available

1 and has been provided by Foothills for these designs
2 has been incorporated in the designs, however it has
3 been made clear by Foothills that further studies and
4 further development and gathering of information will
5 be performed before final designs are to be completed,
6 and thus of course, this information as developed, will
7 be incorporated in the final design.

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

1 Q Now when you talk about
2 information supplied by Foothills do you mean pipeline
3 design information, or do you mean that plus various
4 hydrologic river engineering data?

5 A Again, the answer is both.
6 For example, we have been provided with the pipe speci-
7 fication, the wall thickness grade, by the client and
8 we have been provided by hydrological input for depth
9 of scour by the client.

10 Q What is your own company's
11 role in the process. Do you direct the work of these
12 various consultants who are engaged in different aspects
13 of river crossings or do you simply interpret the data
14 that they provide to Foothills?

15 A We receive the data
16 provided by the clients, we review it to determine its
17 adequacy for the design, and we apply that data into
18 the necessary design calculations to develop the crossing
19 design.

20 Q Just going back to your
21 answer 17 in the first part of it you talk about infor-
22 mation -- several engineering sciences, such as
23 hydrological and hydraulic studies, now that work is
24 being done by other consultants.

25 A By other than Canuck
26 . Engineering, yes.

27 Q Who's doing that?
28 Is that Unies?

29 A Unies provided data on
30 the scour.

1 Q Would it be fair --

2 I see, are they providing the information you set out
3 therein your answer, riverbed degradation potential
4 bed scour, force stability, icing effects, seasonal
5 floods, surface and subsurface drainage and any effects
6 storms would have?

7 A Yes.

8 Q That's coming from Unies?
9 You worked with their --

10 A Klohn Leonoff and Unies.

11 Q I see.

12 A Both, there's some
13 overlapping there.

14 Q And the geotechnical
15 input is coming from Klohn Leonoff?

16 A That is correct.
17 That and published data by
18 CAGSL.

19 Q And then the official
20 geological expertise, where is that coming from?

21 MR. MIROSHA Klohn Leonoff and
22 Sproule.

23 Q You go on to mention the
24 other engineering disciplines, whose work you're going to
25 take into account including metallurgy, stress analysis,
26 corrosion protection, environmental assessment, and so
27 on. Are you co-ordinating any of the work of these
28 various disciplines or are they all reporting to Foothills
29 and you then working with them.

30 MR. WALKER: A We are not coordinating the

1 work of any other consultants.

2 Q When it is that you expect
3 your work on/ ^{these} river crossing designs is going to be
4 completed?

5 A Well that's a little
6 difficult to answer in that I don't have specific
7 schedules for completion of the studies by the other
8 consultants on the crossings

9 Q Do you have a date that
10 you're using for planning purposes?

11 A No, other than we
12 discussed the time table of about 60 days after com-
13 pletion of the data available to our firm for completion
14 of designs.

15 Q Mr. Mirosh, do you have
16 any information as to when this data is going to be
17 in Mr. Walker's hands so that he can get the river
18 crossing designs completed?

19 WITNESS MIROSH:

20 A Yes, the subject of
21 completeness depends on the degree of completeness
22 For instance, we have several months ago, completed
23 what I would call a preliminary river design crossing.
24 We would hope to refine that to a further degree in the
25 next few months as we get our field data in. As to
26 final river crossing design, we don't expect that this
27 would be complete until we had an actual permit and
28 engaged in a final field investigation and design.

29 Q The reason I mention it
30 is because of a comment that Mr. Fawcett made in his

1 evidence and we may well have gone over this with
2 him. I haven't had an opportunity to check back on
3 the transcript, but he said at page 14 of his evidence,
4 in answer to question 25, small interval contouring
5 will facilitate channel river crossing designs to be
6 completed during the upcoming winter. I read that to
7 mean that the final river crossing designs were going
8 to be completed this coming winter. Perhaps I mis-
9 understood what he intended to say.

10 A If I may attempt to inter-
11 pret what he was saying, he was probably referring to
12 orthophotomosaic completeness.

13 Q I see, that's intended
14 to be done this winter.

15 A That is currently very
16 nearly in a state of progress and will carry on through
17 the remainder of this year and next year.

18 Q Mr. Walker, further in
19 your evidence, at page 18 in answer to question 20,
20 in the last paragraph you say in dealing with the
21 design rationale related to selection of single versus
22 dual crossings, quote "If any assessments challenged
23 the security of the crossing design, the crossing
24 design was revised, relocated or redesigned, to ensure
25 a safe crossing rather than taking a dual crossing
26 design approach for the purpose of increasing system
27 security."

28 I was just wondering sir,
29 whether or not that happened. That is were there
30 assessments that challenged the security of the crossing

1 design?

2 WITNESS WALKER.

3 A No, there was an assessment
4 of data received to determine what was required for a
5 safe envelope of river disturbance. All the data
6 that was gathered was not completely consistent and in
7 approaching the design/ that has been presented at this time, we
8 have taken, shall we call it the worst case of disturbance.
9 For example, the depth of cover, using Swimming Point as
10 an example, the depth of cover on that design crossing
11 submitted is in excess of the one that was selected by
12 C.A.G.S.I. in their design. There may be refinements
13 on this when further data comes in. It's not
14 necessarily that the refinements will be towards the
15 more conservative. It's quite likely they will, when
16 further studies are done, that the depth of cover
17 required could be reduced.

18 Q I took the statement that
19 I quoted from your evidence to mean that there had been
20 some river crossing designs that were done, that you
21 then made an assessment of them, and then, if in your
22 view, that assessment challenged the security of the
23 crossing design, well you went about changing it.

24 A Well, certain changes,
25 as the designs were developed were made, that is
26 correct.

27 Q Well did somebody else
28 develop the river crossing designs for Foothills
29 initially and then you make your assessment and you make
30 modifications to this?

1 A No, we developed very
2 preliminary designs for Foothills and running analyses
3 on these designs, found it necessary to make some
4 adjustments to those designs, before the final design
5 at this stage was presented.

6 Q I see and that's what
7 you're speaking of in this sentence in your evidence?

8 A It's the incorporation of
9 additional analyses and the incorporation of additional
10 data as it became available to us during our designs
11 and I'm further referring, should additional data
12 become available, we would reassess those designs and
13 adjust them.

14 Q Which crossings did you
15 do in your very original preliminary design for Foothills
16 that you later reassessed?

17 A Here I'm referring to
18 two crossings, both on the Mackenzie, one generally
19 called Swimming Point area and the other near Fort
20 Simpson area. They're submitted in the application.

21 Q Have the designs that you
22 have worked out changed at all from what appears in the
23 application materials filed by Foothills?

24 A No, the designs that are
25 in the application we have made no further refinements
26 to those designs. Those designs incorporate up to date
27 refinements.

28 Q Are there additional or
29
30

1 further refinements now underway, that you expect will
2 result in changes to those designs?

3 A Currently we are not
4 progressing on further design studies. As I mentioned
5 no further data has been presented by the client.

6 Q Do I take it sir that if
7 additional data pertaining to hydrologic matters and
8 climatological information is obtained, this may lead
9 to refinements of your design that you conceive of as
10 optimizing the design?

11 A I would think that's
12 correct.

13 Q In other words the degree
14 to which you were conservative or cautious in your
15 design of a river crossing is in large measure a
16 function of the data base that is available to you?

17 A Partly.

18 Q As to the parameters
19 against which you must take precautions?

20 A Partly that and partly
21 a philosophy on how the design should be approached.

22 Q Dr. Glockner, we got into
23 a discussion last night about some of the criteria that
24 you had developed for Foothills and I wasn't able to
25 start really at the beginning. I listened with
26 interest to your curriculum vitae as set out in
27 the prepared material and which you reviewed. I was
28 wondering if you might tell us something about your
29 professional experience that is related specifically
30 to permafrost.

1
2 WITNESS GLOCKNER:

3 A I haven't worked specifically
4 with permafrost.

5 Q When were you first
6 retained by Foothills sir?

7 A Foothills contacted me in
8 early April.

9 Q Well at that time, early
10 April, do you know the state of preparation of the
11 Foothills exhibit material on stress analysis?

12 A Was I then familiar with
13 the material is that what you're saying?

14 Q No, you became involved as
15 a consultant early in April. At what state of preparation
16 was the Foothills application, or at least that part of
17 the Foothills application that pertained to your field
18 of expertise, stress analysis? Had they already done
19 it?

20 A As far as I know the
21 application had been submitted or was in the process of
22 being submitted.

23 WITNESS MIROSH:

24 A Yes, the application was
25 filed in May.
26
27
28
29
30

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 Q Which was after Dr. Glock-
2 ner came, but it had gone to the printers, had it, by
3 the time you joined the project?

4 The point I'm getting at is
5 whether or not you had any input into the Foothills'
6 application materials on stress analysis, or has your
7 work been subsequent to that?

8 WITNESS GLOCKNER:

9 A I think primarily subsequent
10 to that.

11 Q I take it though that
12 during the course of your work, you would have reviewed
13 the exhibit material in the application that pertains
14 to stress analysis?

15 A I have reviewed the
16 section on stress design.

17 Q Have you prepared an
18 analysis of it, sir in written form?

19 A I have given my assessment
20 of that section to Mr. Mirosh, yes.

21 Q I wonder if we might have
22 that produced, sir.

23 Mr. Gibbs?

24 MR. GIBBS: I'm not sure what
25 relevance it has to this inquiry sir, that the consult-
26 ant should give his comments to the manager on the
27 design part of the application. If it has relevance, well
28 then it must obviously be produced.

29 MR. MARSHALL: Well sir, I
30 would suggest that nothing could be more relevant than

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 the assessment of the man who is now put forward by
2 Foothills as being their expert on stress analysis.

3 THE COM MISSIONER: You say
4 that this is what, a consultant's report to one of the
5 applicants, and not an internal memorandum, assuming
6 that the latter came within any scope of privilege which
7 it might not?

8 MR. MARSHALL: Well I think,
9 sir, that there's no question of a privilege attaching
10 to a consultant's work for an applicant in proceedings.
11 There may be a frame that could be advanced in certain
12 circumstances about confidentiality and so on but we
13 are not talking about a category of privileged documents.

14 The difficulty we have got here
15 and I could explore this at great length, I'm sure with
16 Dr. Glockner, I could take him through every line of the
17 stress analysis materials presented in the Foothills'
18 application and ask him whether he agrees with it or
19 disagrees with it. I'm trying to shortcut that, and
20 simply get his written report which assesses the Foot-
21 hills' application materials. Obviously, I want to
22 explore what are the differences in opinion between
23 what Foothills has presented formally and what their
24 witness who is now before us, thinks.

25 MR. GIBBS: Well sir, I am not
26 trying to be difficult over this. If it's a document
27 which ought to be produced, it will be produced.
28 There -- this question arising has occurred to me prior
29 to this time, and that is that in the beginning when
30 the directives were issued and the counsel meetings

1 occurred prior to this hearing commencing, we were
2 obliged to list what documents we had in our possession,
3 and people could come to examine them there, in our
4 case, the FOothills' library, and I'm certain it was
5 the same with Canadian Arctic Gas and that still obtains,
6 but then you get into a very expensive and time con-
7 suming, if you reproduce all of these things, and deliver
8 them and mark them as exhibits. They can be done, but
9 my friend knows, I'm sure, full well that I cannot pro-
10 duce an internal report or a memoranda or whatever it
11 is from a consultant to this panel in less than probably
12 four or five days, because it would have to be xeroxed,
13 it has to go on the airplane, it has to get here and
14 it's certainly not going to arrive in time for him to
15 discuss it with this panel.

16 MR. MARSHALL: Well there will
17 be another day, Mr. Gibbs, and we can carry the matter
18 on there. You know, I could take up a lot of time today
19 I suppose, going through it line by line which would
20 bore all of us. There is a memorandum, there has been
21 an analysis done, I submit it's relevant, and I'm
22 asking that it be produced and I'm sure that you will,
23 as you always are, be most cooperative in producing it
24 as soon as you can reasonably do so.

25 MR. GIBBS: Yes, I accept that
26 accolade, but you know sir, whether it's a boring pro-
27 cess or not is beside the point. These witnesses are
28 produced here and filed this material and are available
29 to be cross-examined on it.

30 Now, when I deliver this

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 document, which I will do in due course, it then serves
2 no purpose in this inquiry because this panel is not
3 here any longer. 'It serves only the purpose of providing
4 material to be used really in another place, but if you
5 direct sir, that it should be produced, then certainly
6 we will do so.

7 THE COMMISSIONER: You know in
8 the House of Commons they use that expression "the
9 other place". They are talking about the Senate, I
10 don't know what you people are talking about.

11 MR. SCOTT: Well, Mr. Commiss-
12 ioner, surely if it's produced it has a wider use than
13 Mr. Gibbs attributes to it. It is the views of this
14 witness on the application and I presume, if it is pro-
15 duced, it will stand as if he had expressed those words
16 here.

17 THE COMMISSIONER: Well I am
18 going to direct that the report of Dr. Glockner or his
19 comments, in whatever form they may have appeared, on
20 the material relating to stress analysis filed in the
21 application in May, should be produced and when that is
22 produced, it will be up to counsel to make whatever use
23 of it they deem appropriate. I think that is only fair.
24 We put Arctic Gas through this particular mill many
25 times in the spring, and the shoe is on the other foot
26 now, so we should let them take a few kicks with it.

27 MR. GIBBS: All right. Even
28 though it pinches, we'll wear it.

29 MR. MARSHALL: He may well
30 have agreed with everything.

Mirosh, Bauer, Walker, Glockner
Cross-Exam by Mr. Marshall

1 THE COMMISSIONER: He may
2 well have.

3 MR. GIBBS: He may well have.

4 MR. MARSHALL:

5 Q Dr. Glockner, what work
6 do you currently have underway for Foothills?

7 A I was listening with
8 interest to this discussion here, because the memo that
9 I sent or gave to Mr. Mirosh concerning the stress
10 design was just in the form of a letter. He had asked
11 me at the outset of my activities to review their sub-
12 mission and let him have my comments. I don't know
13 whether it will give you very much but it's a letter
14 which I am sure that they will produce for you.

15 Now that submission, in my
16 opinion, was something that could be expanded and work
17 added to, and we have since then worked fairly vigor-
18 ously to produce further data because we have got some
19 so-called deficiency letters. I was introduced to that
20 term, deficiency letters whereby we submit additional
21 data apparently to N.E.B. or to their submission, and
22 that's what we are doing now. That is really the staff
23 at Foothills is doing this. My role primarily is to
24 give advice and help when they have a problem.

25 Q Do you have assistants of
26 your own, say at the university that work with you?
27 In this consulting assignment?

28 A No, there is no one at the
29 university working with me. All of my students, Ph.D.
30 students and M.Sc. students are working on other

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 projects. This is a private consulting matter.

2 Q I was just wondering
3 whether --

4 A This is not my university
5 research or teaching activities.

6 Q I see. With whom do you
7 interface at Foothills? Who is your contact?

8 A I interface at Foothills
9 primarily with three people, Dr. Carlson, Mr. Tsutsumi
10 and Mr. Wallbridge. When I go in, those are the people
11 I usually see. I don't usually see anybody else.

12 Q I see. They are the
13 people at Foothills involved in the stress analysis
14 calculations?

15 A Yes, that's correct.

16 Q You mention that you have
17 been busy writing deficiency letter responses. Have
18 you done any reports to Foothills, other than the
19 letter that you mentioned being an assessment of their
20 filing materials?

21 A I have done a couple of
22 other things. There was a question of doing some tests
23 on crack arrestors, and I wrote up a small report on
24 that. This was really a proposal for such tests, which
25 came out -- a proposal which came out of a discussion
26 which we held at Foothills and was suggested by some of
27 the people there and I concurred with the usefulness
28 of such a test.

29 Q Have these tests been
30 done?

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 A They are in the final
2 stages of preparation and will be performed soon, yes.

3 Q Are you carrying those
4 out, sir?

5 A I think they are being
6 carried out under my supervision, I'm not carrying them
7 out.

8 Q I see, but we don't yet
9 have results from this?

10 A No, the strain gauges,
11 to the best of my knowledge, installation of gauges
12 would have been completed last night.

13 Q Could you describe the
14 nature of the tests, sir?

15 A Well there will be several
16 tests as we are planning now, and we are trying to look
17 at the stress concentration effects due to crack
18 arrestors, and see whether the observed measured values
19 can be predicted with available theories sufficiently
20 accurately.

21 Q Physically where are the
22 tests being done?

23 A The gauging and the pre-
24 paration of the specimen is being done at A.G.T.L.'s
25 -- well now I'm not sure about the terminology, their
26 workshop down there on Blackfoot Trail --

27 Q Yes.

28 A -- and then the specimen
29 will be be taken over to the --
30

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 WITNESS MIROSH:

2 A To the A.G.T.L. Works
3 DEpartment.

4 WITNESS GLOCKNER:

5 A -- Works Department.

6 MR. MARSHALL:

7 Q I see. You are coordinat-
8 ing the work on this test?

9 A I designed the test.

10 Q I see. And others are
11 doing the actual carrying out of the test?

12 A Yes, I'm not much good
13 at installing strain gauges.

14 Q I see. What other assign-
15 ments have you carried out for Foothills during this
16 period since April when you have been consultant to
17 them?

18 A Well as I say, my primary
19 job or ^{the} objective, I suppose why they hired me, was to
20 try to get input and supervision to the staff there
21 and help to the staff in terms of the analysis problems,
22 stress analysis problems connected with the pipeline
23 design. I tried to indicate the various aspects that
24 we have considered and looked at in my direct submission.

25 Q Yes.

26 A Some eight or nine different
27 points that they have been looking at.

28 Q Right. Has your consider-
29 ation of these other points produced any other written
30 reports?

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 A Not yet.

2 Q Well, I take it, Mr. Gibbs,
3 when the reports are done, they will be included in the
4 supplemental list of relevant reports and studies, will
5 they?

6 MR. GIBBS: I take it that when
7 that time comes, Mr. Marshall will make his usual re-
8 quest for copies also.

9 MR. MARSHALL: You can take it
10 as made.

11 Q Dr. Glockner, what pressure
12 does the stress analysis that you've been involved in
13 consider? Is it 1,250 or 1,440 PSIG?

14 A Maximum pressure as I was
15 given by Foothills that will occur anywhere along the
16 pipeline is I believe 1,250 PSIG, yes, as given in
17 question 25.

18 Q You'll recall, sir, that
19 there has been some discussion with the Foothills'
20 panel on the possibility of the line at some time being
21 increased to 1,440 PSIG, you're aware of that?

22 A I have heard about it, I
23 haven't studied it.

24 Q Well from the hoop stress
25 viewpoint, does this make any difference?

26 A I think that according to
27 the Code and as far as our calculations now indicate,
28 I think the pressure could be increased because we are
29 staying conservative here. We are only going up to 69
30 percent of the allowable hoop stress.

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 Q Well if you went to 1,440
2 that would be 80 percent of the specified minimum
3 yield strength, which is the same as the level at which
4 CAGPL proposes to operate?

5 A That's right.

6 Q Could you tell me, sir,
7 if the effects of gas pressure and temperature different-
8 ial are considered when determining the yield moment?
9 The reason I raise is that my advisors tell me that they
10 don't see these factors taken into account on the
11 exhibits that were produced as part of your evidence
12 last night.

13 A Can you repeat the first
14 part because I was thinking about something else while
15 you were saying it?

16 Q Are the effects of gas
17 pressure and temperature differential considered when
18 determining the yield moment?

19 A I don't want to misunder-
20 stand the question. First of all, the yield moment,
21 the moment at which the pipe will yield is a property
22 of the pipe section and the material in the pipe, it has
23 nothing to do with the other loads and effects on it,
24 so maybe I could ask for some clarification of this
25 question.

26 Q Well as I understand the
27 question, sir, the pipeline when it's initially in-
28 stalled has no gas within it, and there's no pressure
29 above ambient conditions, but then it becomes pressured
30 to 1,250 or perhaps 1,440 depending on what eventually

1 results, so that's one consideration. The other is that
2 the temperature is different from the time of the
3 installation to the time that the pipeline is in operat-
4 ion and the chillers are operating and so on.

1 A That's right.

2 Q It's these differentials
3 we're interested in and we wonder whether or not your
4 analysis and the criteria that you have taken into
5 account take these factors into the equation?

6 A I understand your
7 question now.

8 Q I'm sorry, I should have
9 explained it more fully.

10 A The curves that we
11 presented here deal only with the loads and effects
12 which are shown in diagrams. In other words, they
13 analyze what kinds of deflection the pipe could take
14 in order to produce certain stress levels. Due to the
15 loads which are shown in diagrams. Namely these were
16 frost heave pressures, and over burden and the various
17 other loads which are shown in the diagrams. We have
18 done some other calculations, however, in which we
19 took into account the axial stresses produced by
20 temperatures changes in straight sections of the pipe,
21 as well as the bending moments and axial forces
22 produced in curved portions of the pipe, due to such
23 temperature changes.

24 Q What about the pressure
25 changes? Have those been considered?

26 A Well the pressure changes,
27 they produce changes in circumferential stress and in
28 a secondary way, changes in longitudinal stresses, so
29 that they would not be primary causes of longitudinal
30 stresses in that sense.

1 Q Put in the overall develop-
2 ment of your criteria, these two factors must be taken
3 into account?

4 A They are taken into
5 account, yes.

6 MR. MARSHALL: Thank you
7 gentlemen, those are all my questions.

8 THE COMMISSIONER: Mr. Bayly?
9 CROSS-EXAMINATION BY MR. BAYLY:

10 Q Gentlemen, you refer on
11 the first page of your prepared evidence, to a 60 foot
12 right-of-way, and you have discussed this in your cross
13 examination by Mr Marshall. One of the questions I
14 have to you deals with looping and whether the 60 foot
15 right-of-way plus the working area that you don't
16 propose to use as a right of way, would be adequate to
17 allow for eventual looping of the lines?

18 WITNESS MIROSH:

19 A I might take a try at that.
20 I think we have discussed this and felt that we might
21 need an additional ten or so feet and I would pass that
22 on to Mr. Bauer for further discussion.

23 WITNESS BAUER:

24 A In our construction
25 planning, to answer the direct question about looping
26 or any future looping, the 60 foot permanent right-of-
27 way normally will be sufficient, but the additional
28 60 foot right of way would be required for construction
29 access.

30 Q So am I to take from this

1 that really your proposal would be to recommend to
2 Arctic Gas that they ask for the 120 foot right-of-way
3 so that they would have the working space alongside?

4 MR. GIBBS: I don't think we're
5 making any recommendations to Arctic Gas. We're here
6 to tell the inquiry what the differences are between
7 Foothills and Arctic Gas and one of them is the width
8 of the right of way.

9 MR. BAYLY: Excuse me, Mr.
10 Commissioner. Mr. Gibbs has taken advantage of my
11 slip of the tongue. Will you be recommending to Foot-
12 hills that they would require the 120 foot right of way?

13 A Yes.

14 Q And if you were to loop
15 the facility you say you would require an additional
16 10 feet, would that take it up to 130?

17 A No, the total would be
18 120 feet. We're talking about actually 60 foot
19 permanent right-of-way. And another 60 feet for
20 construction purpose only.

21 Q In those areas, Mr. Bauer,
22 in which you would loop the line, what would be, in
23 your opinion, the proper distance for the two portions
24 of line to be apart?

25 A We do have a diagram
26 outlining the proposed looping, if there is any looping
27 in our submission. I could not recall the diagram
28 number but it is in our submission and we show a
29 diagram in there.

30 Q All right, is there a

1 distance, without referring to the diagram which would
2 be unsafe, a distance between the two pipes?

3 A Well the distance is
4 within code requirements, it's standard pipeline
5 practice.

6 Q All right now you're
7 referring to standard pipeline practice, say in
8 Southern Canada where the problems of permafrost are
9 not encountered is that correct, or generally not
10 encountered?

11 A That's general, that can
12 be adopted in the North also.

13 Q All right and has
14 Foothills or its consultants to your knowledge studied
15 the problems of putting a pipeline and a loop so close
16 together that there may be problems of the two
17 frost bulbs if any occur interacting?

18 A Well, to answer correctly,
19 we make sufficient allowances, if a looping is con-
20 templated or done, that we have a safe distance in
21 between.

22 Q You did take this factor
23 into account, and this being different from perhaps
24 the Code requirements of southern Canada?

25 A I would say so.

26 Q Now, when Arctic Gas was
27 questioned on the matter of river crossings we had asked
28 the panel of witnesses to go into the kind of scenario
29 they would contemplate if there were a break in a river
30 crossing. Now they had proposed dual river crossings and

1 they propose single river crossings for major rivers.
2 Now assume that at a fair sized river, that you will
3 cross, you have a pipeline break, and I know you will
4 say that that is most unlikely but just assume that
5 it takes place. Can you tell me what sort of contingency
6 plans you have thought of in order to do the repairs
7 and what sorts of equipment, men and time would be
8 required to carry out these kinds of plans?

9 WITNESS MIROSH-

10 A I might offer a very few
11 comments. That is a subject for the Operations and
12 Maintenance Panel, the subject of contingency plans.
13 We could add here that we would plan on stockpiling
14 pipe and equipment near the river crossings. this is
15 something we have discussed. That would be a contingency
16 plan.

17 Q All right. now you've
18 referred this to Operations and Maintenance. Do I
19 take it that the people who will be giving evidence on
20 Operations and Maintenance will be the ones who
21 recommended that there be single rather than dual
22 river crossings or was that your recommendation?

23 A Well I think as we
24 discussed yesterday, that was a philosophy which we
25 approached in that we felt that designing one river
26 crossing properly was just as good as designing two
27 river crossings properly.

28 Q Now let me suggest to you
29 that you had a situation in a single river crossing,
30 where you have a river crossing break. And as I understand

1 that means that the whole facility stops sending gas
2 south. And under those circumstances, would I be correct
3 in assuming that you would have to go in, no matter what
4 time of the year, no matter what the terrain conditions.
5 to repair it in order to restore the facility?

6 A Yes.

7 Q Now with a dual crossing
8 if only one went out, I understand that that would not
9 necessarily be so.

10 A We haven't really studied
11 that.

12 Q All right. Let's take it
13 from just a non engineering point of view. If you had
14 two identical sized pipes, crossing the river, going
15 into a single pipe. would it be possible to divert all
16 the gas through one pipe, if there were a failure in
17 the other one?

18 A Yes, assuming that one
19 failed and the other didn't, but there may be environ-
20 mental reasons to move in in any event no matter what
21 the weather or time of year in order to secure the failed
22 section.

23 Q All right. Now when you
24 made this philosophy decision as you have referred to it,
25 to recommend single rather than dual crossings. was this
26 an engineering philosophy or was this one that environmental
27 consultants to Foothills Pipe Line also had an input?

28 A I think it would be fair to
29 say it was primarily an engineering decision which was
30 supported by the environmentalists because of the less

1 disruptive effect of one over two crossings.

2 Q Now when you say less
3 disruptive effect, I'm assuming that you have recommen-
4 dations from your say fish and water specialist
5 consultants on that kind of disturbance.

6 A Well, we have had meetings
7 between engineering and environmental personnel,
8 the fish would probably be one minor concern of the
9 environmental people, perhaps the more major concern
10 would be the drainage and slope stability and earth
11 movement problem of two crossings as opposed to one.

12 Q All right. Now one of
13 the statements that was made earlier by Foothills was
14 they do not propose at this time to go to Prudhoe Bay
15 or anywhere in Alaska to bring gas to American markets
16 through Canada but that they might, under some circum-
17 stances do so. Has that possibility been referred to
18 you for engineering advice?

19 A We have of course, been
20 concerned in very general terms about what effect looping
21 would have on our pipeline, wherever the gas may come
22 from. We have, as well, not had very much time to
23 study it, but we have looked at the possibility of
24 bringing gas in from Prudhoe Bay. although as Mr. Blair
25 pointed out, it's a very low priority item, and it's
26 one which we feel we probably should at least have some
27 knowledge of in view of the fact that C.A G.P.L. is doing
28 this.

29 Q Now assume that this is
30 a possibility and you've said it is have you gone to the

1 extent of studying the possible ways of going to Alaska
2 to pick up this gas, whether you would go by what Arctic
3 Gas calls the prime or alternate routes or whether you
4 would opt for the cross Delta alternative.

5 A Well it would be fair to say
6 that we haven't devoted a great deal of study to this.
7 At the present time, whatever work has been done, which
8 is extremely minimal, has been aimed at the so-called
9 cross Delta route.

10 Q What level has that
11 study reached?

12 A The point of hydraulics
13 studies.

14 Q And when you say hydraulics
15 studies are those studies of the actual crossing of
16 Shallow Bay or are those general hydraulics studies of
17 the Mackenzie River or --

18 A I'm sorry, they refer
19 to the pipeline hydraulics studies. the placement of
20 stations, the sizing of pipe.

21 Q All right, so with the
22 question of actual crossings of bodies of water, you
23 have not gone into that at this point?

24 A Well we've made some
25 very gross assumptions. We certainly haven't carried
26 out shall we say in depth studies towards carrying gas
27 from Alaska.

28 Q All right. Do you have
29 preliminary studies that have been prepared and submitted
30 either to you or by you to Foothills?

1 A We do have some work which
2 relates to bringing gas in from Alaska, yes.

3 Q Now, I'm not aware that
4 that has been listed as documents in / ^{the} possession of
5 Foothills and I'm wondering if Mr. Gibbs can enlighten
6 me on that?

7 MR. GIBBS: Well no sir, these
8 studies as Mr. Blair pointed out when he was on the
9 stand, this has been looked at in a preliminary way,
10 and it may be a possibility that will occur sometime
11 in the future. These are very primitive studies, not
12 much more than looking at the ground and saying, this
13 might be the size of pipe and so on.

14 THE COMMISSIONER: These are
15 studies in connection with bringing gas from Alaska?

16 MR. GIBBS: Yes, they are not
17 part of the Foothills application, and in my submission,
18 it would be wrong to furnish them as being evidence of
19 anything at this stage. If at any time, Foothills is in
20 the position of wanting to do this, then these studies
21 would be updated and produced, but at this stage, they
22 would be evidence of nothing at all, except some
23 engineers looking in a preliminary way.

24 THE COMMISSIONER: What Mr.
25 Bayly is concerned with is this. He represents the
26 Inuit people of the Mackenzie Delta. Arctic Gas keeps
27 threatening to bring in an amendment to its application
28 to bring the Prudhoe Bay supply leg across the mouth of
29 the Mackenzie Delta.

30 MR. GIBBS: Excuse me sir, that's

1 more than a threat, that's been filed now I think with
2 the National Energy Commission.

3 THE COMMISSIONER: Well has it
4 been filed as a proposed amendment. I don't think so.

5 MR. MARSHALL: I believe the
6 situation is sir that information has been made
7 available to the Department of Indian and Northern
8 Affairs and to the National Energy Board, about a
9 possible alternative across the Delta. As has been
10 indicated in evidence, though I think Mr. Horte said
11 the studies haven't yet been completed, so they haven't
12 been able to make up their mind as to whether or not
13 it would be appropriate to amend the application.

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 THE COMMISSIONER: I understand
2 that you filed that cross delta material with us back
3 in May or June, as I recall, unless I'm slowly losing
4 my mind. There was a whole two volumes of material.
5 At any rate, the relevance of this, as I understand it,
6 is that if your people for whatever reason, took a look
7 at the cross delta route and said "It's good, it's no
8 good, or we agree with Arctic Gas", that is something
9 that is relevant from Mr. Bayly's point of view. That's
10 all I'm getting at. We're not trying to -- at least I
11 am not -- interested in anything more than that.

12 MR. GIBBS: Well we certainly
13 since the volume was filed, and it was filed only I
14 think two or three weeks ago with the National Energy
15 Board, at least that's when it became public, obviously
16 we must look at it and see whether we agree or disagree
17 or criticize, in preparation for its becoming a subject
18 of discussion in detail here, and at the National
19 Energy Board, but that really has nothing to do, sir,
20 with the very preliminary glance that we have taken
21 at Alaska, and in my submission, we ought not to be put
22 in the possession of furnishing a document and then
23 being saddled with the accusation that we are applying
24 to bring Alaska gas when we are not.

25 We look at it no more seriously
26 than my friend's, to the east of the Mackenzie and
27 through the Great Slave Lake alternate route, about
28 that stage, and although anything that is relevant to
29 the inquiry, certainly we will produce, but at this
30 stage, in my submission, it's simply isn't, and it's

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 too primitive to be of any help.

2 MR. BAYLY: Mr. Commissioner,
3 my problem is that both Arctic Gas and Foothills have
4 pleaded this particular point, and on this particular
5 possibility that they are both too primitive in their
6 studies, and my problem is that at some point we may be
7 faced with this alternative, and it may be after the
8 Inquiry is finished.

9 Now, I'm not suggesting that
10 Mr. Gibbs should necessarily furnish something on the
11 back of an envelope that has been scratched by one of
12 his consultants, but at some point we are going to be
13 discussing the cross delta alternative if it's filed
14 by Arctic Gas. I would submit that at that point,
15 anything that has been studied on it by any of the
16 possible builders of this line, who contemplate either
17 seriously or as a remote possibility bringing Arctic
18 -- bringing Alaska gas across the Canadian Arctic,
19 should be made to file whatever reports they have,
20 because they are relevant, whether they are primitive
21 or not.

22 MR. GIBBS: Well sir, in my
23 submission they -- we are not applying and for my
24 friend's comfort, we have no intention of coming along
25 at some stage in this Inquiry and saying now we want
26 to go to Prudhoe Bay. That's not our plan.

27 Now, when it comes time to
28 look at the cross delta route as filed by Arctic Gas,
29 certainly we are going to be as critical as we feel
30 the occasion requires, and so should my friends, but

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Marshall

1 whatever we may have done in a very preliminary matter,
2 certainly can have nothing to do with the plan of
3 Arctic Gas. They're the ones who studied it, they're
4 bringing forth the detail, they're the ones who want to
5 do it, not Foothills. We would then become in no
6 different a position than my friend, Mr. Bayly. We are
7 not an applicant in that section, we are merely another
8 participant.

9 MR. BAYLY: Mr. Commissioner,
10 we are not an applicant either, but I would assume that
11 if we had prepared studies which refuted the possibility
12 of going across the delta, that according to your rulings,
13 we would be obliged to produce those as being relevant
14 to this Inquiry, whether we intended to build the pipe-
15 line ourselves or not.

16 THE COMMISSIONER: There is no
17 argument about that.

18 MR. GIBBS: We haven't done
19 that, we have not --

20 THE COMMISSIONER: Mr. Gibbs
21 is saying that these things haven't arisen to the level
22 of studies for reports. If somebody flies over the
23 Mackenzie Delta and he turns to someone and says, "This
24 doesn't look so good", and he's saying that these
25 aren't considered opinions, as I understand him. It's a
26 point that has to be taken into account.

27 Can you help us out here, Mr.
28 Scott?

29 MR. SCOTT: Mr. Commissioner,
30 I didn't understand that it was at that preliminary

1 stage. If it is at the preliminary stage you described,
2 obviously Mr. Gibbs might not be required to produce it,
3 but I understood him to say, and I may be mistaken, that
4 some work had been done and some kind of report made,
5 and the reason why he thought it should not be produced
6 was that it didn't relate to any application he was
7 making.

8 Now, if that's his objection,
9 that is not an objection that should be given weight to,
10 because his obligation surely is to produce reports that
11 he has, whether they relate to his application or not.
12 As long as they relate to the subject matter of the
13 Inquiry --

14 THE COMMISSIONER: No, I don't
15 think he's going to argue about that. As I understood
16 Mr. Gibbs, his point was that these were so primitive
17 that the people who made them wouldn't be altogether
18 happy that they were brought forward and neither would
19 he.

20 MR. SCOTT: The advanced disclaimer
21 is that they are permanent, presumably they are going
22 to be of use to nobody and then in a practical sense
23 no harm can be done by producing them.

24
25 MR. GIBBS: Really my friend
26 can't be serious about that.

27 MR. SCOTT: Mr. Commissioner,
28 it's not quite as simple as that. If there is a report
29 that -- maybe it's only two or three pages and that is
30 regarded in these circumstances as primitive, I gather,

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 from the volumes of material that are traditional
2 if it's only two or three pages, and Mr. Gibbs wants to
3 add a disclaimer and say this isn't the final thinking
4 on it, or we intend to do more refined work, that is
5 something that will go to its weight, but it seems to me
6 that if it is, in a real sense, a report or an analysis,
7 there's no reason why it should not be produced, simply
8 because it isn't the last word on the subject.

9 If, on the other hand, it is
10 truly a note on the back of an envelope, I am sure Mr.
11 Bayly isn't going to want it. If he were shown it
12 privately, he could perhaps make a judgment as to the
13 extent to which he thinks it is significant.

14 MR. GIBBS: Well sir, clearly
15 it's more than a note on the back of an envelope, but
16 really my prime objection is that it is not part of what
17 Foothills is seeking to do, therefore these witnesses
18 ought not to be expected to speak. We are here only to
19 show these differences, and that difference is that we
20 don't propose to go to Prudhoe Bay. That, it
21 seems to me, is the end of it.

22 Now, Arctic Gas, in order to
23 substantiate their cross delta route, have got to pro-
24 duce their drill hole data, the environmental studies,
25 and the water temperatures and how the fish move and
26 all of the rest of that material, but obviously we haven't
27 got that, we haven't reached anywhere near that stage.
28 In my submission, it is of no use whatever to assess
29 what Arctic Gas plans to do, to have before this
30 Inquiry, whatever number of pages this very preliminary

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 and very primitive look at what might occur in the
2 future.

3 If that time ever came, and Mr.
4 Blair made it plain that was just a possibility, then
5 obviously we have to make an application to do it, and
6 then we have to produce the material, and then my friend
7 can examine it at great detail, but the subject matter
8 now is -- or not now, at some stage is the Arctic
9 Gas crossing, not Foothills at all.

10 MR. MARSHALL: Mr. Commissioner,
11 I wonder if I might make a brief comment. The discuss-
12 ion reminds me a lot about a discussion on looping.
13 Arctic Gas did not apply to loop the pipeline, and your
14 request though was for information to be provided,
15 because this was a possibility that might some day result
16 and you wanted to be able to have it considered and
17 explored so that the environmental and socio-economic
18 implications and so on could be considered. It followed
19 then that witnesses have dealt with that, and that matter
20 has been explored.

21 Further, you had asked us or
22 I think Mr. Scott had asked us, and we had agreed, that
23 when serious consideration is being given to route
24 amendments, whether or not Arctic Gas has got to the
25 point of making up its mind that it's going to apply for
26 an amendment to its route, we'll notify the Inquiry.
27 The purpose being that the Inquiry wants to be able to
28 consider these and have some input on them and give
29 them some consideration, bearing in mind that the
30 Inquiry is going on now and it's important to consider

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 these things as early as possible.

2 I'm sure on this question of
3 whether or not it's a report or it's not a report, or
4 it's something on the back of an envelope, Mr. Gibbs
5 will use his good sense as to whether or not he's got
6 a report or he's got a study, and whether or not it's
7 relevant to the subject matters that are being considered
8 by this inquiry.

9 MR. SCOTT: Mr. Commissioner,
10 could I add something? Perhaps I did have Mr. Gibbs'
11 real objection right when he said this is not something
12 they are applying for.

13 Now, let me just take this
14 analysis. Supposing Foothills had a report, no matter
15 how primitive, indicating that a 48 inch pipeline was
16 no good, and Mr. Bayly asked for production of it, Mr.
17 Gibbs would, if he follows the course he is taking today,
18 so that has nothing to do with it because we are not
19 asking to build one.

20 Well now, that is an untenable
21 objection in view of the ruling, and apart altogether
22 from the rulings, in view of the positional rules, about
23 what is relevant. Mr. Bayly is entitled to make his
24 if I can put it this way,
25 case/against Arctic Gas out of the mouth of another
26 applicant or other intervenor, whichever hat Mr. Gibbs
27 is wearing today. I just

28 don't see any legitimate objection to it unless it not
29 be a report, and whether it is designated a report,
30 is surely something that can be judged informally by
Mr. Gibbs, by Mr. Bayly, the other counsel and perhaps

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 yourself, sir, when it is produced.

2 THE COMMISSIONER: Mr. Bell?

3 MR. BELL: Just so I get
4 a chance to say something, sir, it seems to me that
5 even if the document is not a report, it is still sub-
6 ject to the power of this Inquiry to have it subpoenaed.

7 MR. GIBBS: Well one would
8 hardly expect that it is necessary to go to that length,
9 sir.

10 THE COMMISSIONER: Well the
11 suitability of the cross delta route for transport of
12 Alaskan gas was placed in issue by Arctic Gas in the
13 spring, early on in this Inquiry, when they told us,
14 quite fairly and frankly, that they were looking into it.
15 They had prepared a good deal of it in material which
16 they filed with the Inquiry. They told us their
17 environmental tests were being carried out over the
18 summer. We have all been thinking about that cross
19 delta route ever since, and it seems to me that the
20 point that is made by Mr. Scott is sound. If Foothills
21 had never become an applicant in this proceeding, but
22 had remained an intervenor, then it would have been
23 obvious to everyone, it seems to me, that if it had a
24 study or a report in its possession relating to the suit-
25 ability of the cross delta route, any other party
26 could have called upon Foothills to produce that study
27 or report.

28 The -- so I direct that the
29 study or report, or studies or reports, that Foothills
30 has carried out relating to the suitability of the

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 cross delta route, be produced. I quite understand
2 that these were apparently of a tentative nature, and
3 that no one who was responsible for their preparation
4 wants to present them to a learned society's conference,
5 as the last word on the subject. I think we should
6 have them.

7 Mr. Bayly, you're still --

8 MR. BAYLY: Yes, I will
9 continue.

10 MR. GIBBS: There is a question,
11 sir, of when they should be produced. As I understand
12 from my friend, Mr. Scott, in due course, we will be
13 examining in more detail the cross delta route as filed
14 recently by Arctic Gas, and perhaps in preparation for
15 that time is the time when this report ought to be
16 produced, whenever it is.

17 THE COMMISSIONER: I think
18 there is a good deal of logic in that. I think you
19 should produce it when you can, but I don't suppose we
20 will be going into it until we go into that whole delta.

21 MR. GIBBS: I'm not sure what
22 it looks like even, but whatever it is, we will --

23 MR. MARSHALL: Well sir, if
24 that is to be the rule of thumb, we will relax and stop
25 hustling to get the stacks and stacks and stacks of
26 reports that my learned friend has asked for, concerning
27 subject matters that --

28 THE COMMISSIONER: Excuse me,
29 Mr. Marshall.

30 MR. MARSHALL: -- for some

1 months.

2 THE COMMISSIONER: Mr. Marshall,
3 I said that I mean to stop this and adjourn for coffee
4 in a minute. What I said to Mr. Gibbs was I think he
5 should produce the report or reports as soon as he can,
6 but that we likely wouldn't be going into it --

7 MR. MARSHALL: Fine, thank you.

8 THE COMMISSIONER: -- until we
9 reached the delta thing, so --

10 MR. MARSHALL: I'm sorry, I
11 misunderstood.

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

1 THE COMMISSIONER: Can we have
2 coffee now?

3 MR. SCOTT: There's one matter
4 just before we have coffee. I took this to be
5 the point that Mr. Gibbs has raised that this may
6 be a scenario, to use Mr. Bayly's words for an
7 attack to be mounted against Arctic Gas' cross
8 Delta route when it is produced before the Inquiry
9 in the Delta Phase. It will have certain utilities
10 for Mr. Bayly now. Is Mr. Givvs asserting that he
11 doesn't want to produce it now because it will
12 telegraph his concerns to Arctic Gas in advance.
13 If that is what he is saying is that a legitimate objec-
14 tion

15 MR. GIBBS: No sir whatever
16 the details of the material, it was not prepared to
17 criticize Arctic Gas, as I tried to make plain at the
18 beginning. We looked at the possibility. Now it may
19 have no relevance to what Arctic Gas proposed. I don't
20 know, I haven't read it, but it's not an attack.
21 We'll mount that in due course.

22 THE COMMISSIONER: All right,
23 well we'll adjourn for coffee.

24 (PROCEEDINGS ADJOURNED)
25
26
27
28
29
30

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. BAYLY: Mr. Commissioner,
the total panel doesn't seem to be there, and I think
Mr. Conway has gone to fetch them.

MR. GIBBS: The missing witness
is Mr. Bauer. My friend says he has no questions for
him.

MR. BAYLY: I hadn't put it
quite that way, but I'm prepared to begin and if Mr.
Bauer is required, perhaps I can go on to a different
question and come back to it.

MR. GIBBS: He will be here
as soon as we find him, sir.

THE COMMISSIONER: Well Mr.
Carter can tell Mr. Marshall what pithy questions you've
asked when he returns.

MR. BAYLY: Yes, sir.

Q Could we begin again?
In a discussion you had in cross-examination by Mr.
Marshall earlier today on the subject of block valves
not being required because you feel the pipeline in
this isolated part of the country is less prone to, or
not prone to third party damage, if I were to suggest
to you that this line may well be part of a corridor of
development, which might include hydro-transmission
lines, oil pipelines, roads, would that change your
assessment of the possibility of third party damage
and the requirement for block valves in your pipeline?

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 WITNESS MIROSH:

2 A Well I think only if a
3 large number of these facilities were to be built under-
4 ground as pipelines are.

5 Q Well let's say that you
6 are faced with an oil pipeline that may at some point
7 require looping, and a gas pipeline that may require
8 looping, all of which must share an area within a pro-
9 ximity which would mean that traffic would be going
10 back and forth close to the line, would that change
11 your assessment?

12 A Well, of course this line
13 would be extremely well marked and my reference to
14 third party damage statistics is to all of the many
15 lines buried in the southern part of Canada and the U.S.
16 which are generally unmarked and people dig into with
17 some degree of recklessness, I suppose. I don't expect
18 this to be occurring on this line.

19 Q Is that because of the
20 difference in northern people, or is it because of some-
21 thing else? I'm thinking, for example, I'm not meaning
22 to be facetious, of a winter situation where it's diffi-
23 cult to see the markings on your pipeline, except that
24 there is a right-of-way. There might easily be some
25 digging, for example.

26 A Well I think the right-of-
27 way itself will be an obvious indication that the pipe-
28 line is there, in other words, the bush will be cut at
29 that location. There will be pipeline markings.

30 Q All right, well let's

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 assume we have a corridor and that all the facilities
2 had to go through something as narrow as the Gibson gap,
3 would it bear -- and under those circumstances if various
4 facilities were to share that route, would it be required
5 to put block valves in?

6 A Well I think it would be
7 fair to say we would have to study that aspect, but I
8 might point out that the Gibson Gap, since it is such a
9 narrow location, and if there were a lot of facilities
10 going through there, would be subject to a lot of
11 regulatory conditions which by themselves would impose
12 that people would know where the pipeline is.

13 Q Let us assume that you
14 were to build the line and were to be granted approval
15 without block valves, but it appeared at a later stage
16 that there was so much traffic and development in the
17 area of your pipeline that you required block valves,
18 can they be installed after the pipeline is in place?

19 A Yes, I think if we deter-
20 mined for whatever reason that they were required,
21 then they could be installed after.

22 Q Now is the reason for
23 not installing them expense, because you have referred
24 to a million dollars per valve. How many valves would
25 be required, if I may start with that?

26 A Well I think we are only
27 talking of 17. The words I used did not emphasize
28 expense, but I think cost effectiveness was one portion
29 of that decision. I believe necessity was the other
30 judgmental factor.

Q All right, so this is again part of what I may call the engineering philosophy that they are not required for the integrity of the pipeline as you envisage it?

A Correct.

Q But that the expense is not a governing factor, and that it would be approximately 17 million dollars?

A Well of course every dollar counts. Seventeen million is not a large amount in terms of the entire project, but if we feel it's not a necessity, and if we feel we can save some money, then I think that's an engineering judgment we would make.

Q Could the line you propose be built with block valves if that were a regulatory requirement or a recommendation of this Inquiry that were accepted?

A Certainly.

Q And may I take it that because you say you have fixed a price for these, that Foothills has gone either to its consultants or on its own, to the extent of finding out what those do cost and to get, at least, broad general estimates of their cost?

A Yes, we have made assessments of the cost of installation and purchase.

Q In question 5 on page 4, and Mr. Commissioner, while I think of it, I am just wondering if I might make a suggestion to Foothills that would make it easier to use this evidence if they

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 were to number the pages. I don't mean that as a
2 criticism, but just something to facilitate things
3 for counsel.

4 At that question, the question
5 itself talks of putting the compressor stations at an
6 approximate distance of 50 miles. Now, when we dis-
7 cussed the Arctic Gas application with its consultants,
8 they gave evidence that the distance was quite critical,
9 that there could be some shifting but not very much in
10 the distance to get the optimal horsepower, compression,
11 et cetera, from the compressor stations. Is that the
12 same in your estimation?

13 A Well distance is critical
14 in that one has a finite amount of horsepower and one
15 can only extend the distance between stations up to the
16 limit that that horsepower can handle. One can shrink
17 the distance between stations somewhat arbitrarily
18 because then you get excess horsepower, but then there
19 is an economic penalty. So to that extent, it is
20 critical, but there are other means. For instance, we
21 are proposing 24,000 horsepower compressor units. If,
22 for some reason, we had to increase the distance margin-
23 ally and exceeded that particular horsepower rating, we
24 could go to a horsepower size larger. This would
25 require further study and we wouldn't want to do that
26 only at one location, we would want to make sure that
27 all the stations were the same.

28 Q All right. Now what's
29 the reason for having them all the same, and the reason
30 I ask that is I can picture the possibility of, say,

1 people, native people or local people in a certain area
2 saying we don't want the compressor station where you
3 propose to put it, because we use that area for something
4 else. We would like you to move it five miles down the
5 line. If that were the case, could you put in a single
6 station at a higher horsepower, or would you, as you
7 have suggested, want to have them all the same horsepower?

8 A Well to a degree we could.
9 The reason for trying to keep them the same, of course,
10 is one primarily of operations and maintenance, so that
11 the spare parts situation and the repair procedures and,
12 in fact, familiarity with the equipment by the personnel
13 operating the line, would be optimized.

14 We could, if we had to, let's
15 say on a theoretical basis, increase the spacing between
16 any two stations and add a larger unit to the downstream
17 station, but there is a limit to how far we can go in
18 that temperature of the gas does become a constraint in
19 spacing the stations too far apart. In other words, the
20 temperature tends to drop due to the Joule-Thompson
21 effect primarily, and one gets to a point if one spaces
22 stations too far, that the gas temperature at the
23 suction of the downstream station could be below that
24 which is specified for the pipe transition temperature.

25 Q Well given the size
26 compressor station in horsepower that you plan to use
27 and the yield interval that you suggest, what is that
28 flexibility in your estimation?

29 A Well I would say on the
30 24,000 horsepower units and some 30,000s that we have,

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bayly

1 there is a degree of flexibility in being able to in-
2 crease the spacing at any one location, perhaps by a
3 half a mile or more, but not much more. There is a
4 degree of reducing the spacing between stations, possibly
5 to in excess of a half mile, but then what one does at
6 one station, one has to see if the other stations can
7 pick it up or how the effect is on the total hydraulics.

8 Q All right, but in terms
9 of what you propose, it would be possible to move them
10 one way or the other, approximately half a mile,
11 should there be compelling reasons, environmentally or
12 socially for doing so?

13 A Well in fact we have done
14 this in our preliminary work thus far. We have deter-
15 mined where hydraulic locations for stations were to
16 be originally. These locations were subject to review
17 by geotechnical and environmental personnel. There
18 were a couple of changes made due to these constraints,
19 subsequently causing a redesign hydraulically of the
20 entire line.

21 Q All right. Now, at what
22 point would you say that your appraisal of where they
23 should be will be finished?

24 A Well again it's like the
25 answer to most of the questions. We're in a continually
26 synergistic situation where information is coming in
27 and we are making adjustments. The final design we
28 don't expect, would be fixed until after we have a
29 permit and we get into some very serious field work,
30 drilling for station locations, the drainage

1 considerations. These will be fed back to hydraulics,
2 and there's an interaction there which will continue
3 right through to the end.

4 Q So you would not propose
5 to fix this until prior to this hearing, and the N.E.B.
6 hearing has provided you with the approval you would
7 need to go ahead?

8 A Well they are fixed at
9 this point in time, based on certain assumptions, but I
10 think we all understand that when we get in the field
11 we may have to make adjustments.

12 Q Fine, and have you decided
13 on or discussed machinery for getting input from other
14 than engineers on the positioning for final design?
15 Would you expect to have your environmental and your
16 socio-economic consultants, say, involved in that
17 process?

18 A Yes, of course they have
19 been and they will continue to be providing us one set
20 of input parameters.

21 Q And would that continue
22 after regulatory approval?

23

24

25

26

27

28

29

30

1 A Yes because the serious
2 design will of course begin at that point.

3 Q You, at page five, referring
4 specifically to question number 6, talking about above
5 ground piping, in the answer one, you state that above
6 ground piping at selected vehicular bridge crossings
7 of rivers on the Yellowknife /Pine Point community gas
8 service laterals are contemplated. Can you let me
9 know which rivers you're speaking of?

10 A Kakisa I believe is one
11 if that's the correct pronunciation. I can't recall
12 the other two, I'm sorry. But there are three in total.

13 Q And at what stage are the
14 plans for crossing these above ground, these three
15 rivers?

16 A Well the plans again are
17 preliminary. We have a preliminary design, we have
18 obtained structural drawings from the Department of
19 Public Works for these three bridges, we have designed
20 hangars in a preliminary way, that would be supported
21 from the bridge. We've looked at in a general way how
22 the approaches to the bridges should be made. We feel
23 that it can be done quite safely and adequately.

24 Q Would these bridges in
25 your contemplation be constructed by the government
26 involved and your facility be hung from them, or would
27 they be constructed by Foothills or contractors?

28 A The bridges are all
29 existing.

30 Q They would be on existing

1 bridges?

2 A On existing bridges, yes.

3 Q Have the bridges been
4 studied to the point of finding out whether they are
5 adequate say and large enough to carry the lateral
6 facilities?

7 A Yes, in a general say we're
8 convinced that the load imposed by the pipeline will not
9 put the bridge in any jeopardy at all, and we will con-
10 tinue to have further discussions with the Department of
11 Public Works on these.

12 Q Now have those discussions
13 with the Department of Public Works resulted in any
14 memoranda or reports that haven't made it to the
Inquiry?

15 A No, I don't think we've
16 kept minutes on those meetings. There are references
17 in the meetings, in general reports, that are made
18 within Foothills by various supervisors but we have
19 not formalized the meetings.

20 Q I wonder if that material,
21 when it has been -- when it is at the stage that it
22 has been rendered into a report or recommendation, could
23 be brought before the Inquiry, Mr. Commissioner.

24 MR. GIBBS. If it ever does
25 reach that stage. My friend should understand that
26 these are discussions, telephone conversations, in
27 relative degrees of informality and we may never get
28 to a report stage. But if it does, we'll produce it.

MR. BAYLY:

1 Q Now if I could refer you
2 to the 14th page of your evidence, question 17 and the
3 answer to that on river crossing design.

4 I think this was probably a
5 question that should be addressed to Mr. Walker. I
6 understand from your cross-examination by Mr. Marshall
7 that you have arrived at a certain general stage in
8 discussion of river crossings. Are there specific
9 rivers you have studied with regard to alignment for the
10 purpose of testing out your theory. Now this was some-
11 thing that Arctic Gas have done with certain rivers.

12 WITNESS WALKER:

13 A I answered that in
14 response to Mr. Marshall. There were two specific
15 crossings, the Mackenzie East Channel, the Swimming
16 Point area and the Mackenzie River upstream of Fort
17 Simpson.

18 Q And do you contemplate
19 doing these kinds of studies on major river crossings
20 such as for example, the Great Bear River crossing
21 prior to final design?

22 A Well I'm sure the procedures
23 to arrive at a final design will include the steps that
24 have gone forward to date on the two crossings I've
25 mentioned, yes.

26 Q Do you contemplate
27 reserving that until after permit has been received or
28 would you contemplate continuing those up to the level
29 that you conducted the Mackenzie River crossing studies
30 on major river crossings.

1 A I think that will depend
2 on the direction from our clients. The normal procedure
3 before completing a final design of course would be to
4 develop several design approaches, evaluate these and
5 select one for final design.

6 Q I take it then that that
7 work hasn't been completed for crossings other than the
8 two you mentioned.

9 A Not by our company, no.

10 Q Now you referred to certain
11 studies done by Unies Limited, on rivers and their
12 behaviour. Have they also done, to your knowledge, work
13 on the crossings of rivers for Foothills?

14 A On other crossings?

15 Q Yes.

16 A We have been provided some
17 data on other crossings by Unies and by Klohn Leonoff,
18 yes.

19 Q All right. Now is that
20 data different from the Unies data and reports that were
21 submitted as part of the EPB presentation by that company?

22 A As far as depth of
23 investigation, I'm sure it is different.

24 Q When you say depth, are
25 you talking about with regard to specific rivers or
26 depth of analysis of rivers in general?

27 A I'm sorry, the extent of
28 investigation is what I'm referring to.

29 Q So there's been more
30 field work since they did their report for EPB.

1 A Probably more analysis
2 work.

3 Q I gather that we will
4 have the benefit of Mr. Jarvis from Unies at a later
5 stage this week or early next week? Is that correct,
6 Mr. Gibbs?

7 MR. GIBBS: Mr. Stafford, I
8 believe, not Mr. Jarvis.

9 MR. BAYLY: Stafford?

10 Q On page 16, here I'm
11 referring to the second page and question 18.

12 Mr. Walker, your evidence refers
13 to smaller river crossings, and your contemplation of
14 doing the work on constructing those in the wintertime.
15 Now has work been done to your knowledge and in conjun-
16 ction with your work by environmental people to ensure
17 that this work can be done without damaging fish over
18 wintering spots, spawning areas, without adding to the
19 silt load appreciably of these rivers in a dangerous way?

20 A Yes, work has been done in
21 these regards?

22 Q All right and has it been
23 done in what I think is called a site specific way
24 river by river, or is this something that has been done
25 in a general way?

26 A It's been done site
27 specific in regards to selection of the crossing location.

28 Q In other words, you have
29 chosen specific rivers that you classify as small stream
30 crossings, for this winter construction method, would that

1 be the way of looking at what's been done?

2 A Let's be sure of what
3 we're defining between small and major stream crossings.
4 There has been some definition presented on this and
5 those crossings that were defined as major crossings,
6 other than the two specific ones we did designs for
7 have been investigated in this regards.

8 Q All right. and what rivers
9 are those?

10 A I don't have a list of
11 those available at present but I'm sure they can be
12 supplied.

13 Q Would those be some things
14 that we could get from Mr. Stafford?

15 WITNESS MIROSH:

16 A If I could answer that. the
17 geotechnical panel can answer that question and the
18 information will either come from the Klohn-Leonoff
19 members, or probably will come from the Klohn-Leonoff
20 personnel.

21 Q Allright, we can expect
22 those in the same panel as the Unies people?

23 A That's correct.

24 Q Without going into the
25 studies that have been done on the cross delta and the
26 possibility of bringing Alaskan gas to the Foothills
27 facility, do you know if any of that river work has been
28 done on North Slope River?

29 A We haven't done any work
30 of that nature at all. Our reference to a study was

1 merely based on an assumption that the cross delta route
2 was one we would look at quite immaterially of any
3 environmental considerations. because we haven't looked
4 at these. We're merely interested in seeing what
5 stations spacing is involved in and looking ultimately
6 at the construction difficulties. Very preliminary in
7 nature with no respect going into depth.

8 MR. BAYLY: Those are all
9 the questions I have Mr. Commissioner.

10 THE COMMISSIONER: Thank you.
11 CROSS-EXAMINATION BY MR. BELL:

12 Q Mr. Mirosh, on the first
13 page of your testimony you talk about some of the
14 differences in pipeline design between Foothills and
15 Arctic Gas and one of them which has already come up
16 in previous cross-examination is the fact that Foothills
17 proposes a 60 foot wide permanent right of way for the
18 mainline plus a 60 foot working space adjacent to that
19 right of way, whereas Arctic Gas proposes a 120 foot
20 wide right of way. I take it that the 60 foot wide
21 right of way ^{would be owned by Foothills} and the working space would be leased by
22 Foothills during the construction period, is that more
23 or less what you contemplate?

24 A That's rather difficult
25 to know what kind of title one would get from the
26 Department of Indian Affairs sir. We expect that the
27 long term use would relate to the right of way, and a
28 short term use to the working space. Whether it's in
29 the form of an easement or a lease or what, I don't
30 think anyone can say at this stage.

1 Q Yes. well I don't to get
2 into the legal technicalities of it, I just want you
3 to draw in general' terms, the distinction that you're
4 making here. Can you tell me - - you said that this
5 portion, this 60 foot working space would be cleared.
6 Would there be any activitiestaking place on this
7 60 foot right of way which in general terms Arctic Gas
8 would not be engaging in also?

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bell

1 In that half of the right-of-
2 way?

3 A I think not, but the point
4 that we were trying to make there was that we might not
5 need the entire 60 foot working space in some areas, in
6 which case we would not cut some trees down, if we only
7 needed 40 feet in some area additional.

8 Q Well can you estimate for
9 me what proportion of the right-of-way that would be?

10 A No, sir.

11 Q Would it be a very sub-
12 stantial portion?

13 A I don't think I could
14 estimate that for you right now, but there would be
15 some areas, and it might be substantial, I'm not
16 certain.

17 Q And conceivably if these
18 areas weren't needed for construction purposes, it may
19 well be that Arctic Gas wouldn't clear it either?

20 A Conceivably.

21 Q And as far as the effect
22 on the environment within that 60 foot strip is con-
23 cerned, there wouldn't be any substantial difference
24 either, would there?

25 A Well only in that we
26 would attempt to confine our operations and maintenance
27 activities to the 60 foot permanent right-of-way.
28 Obviously this might not be able to be done every place,
29 but that would be our intent.

30 Q Are you saying then that

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bell

1 once construction was finished, that you would disclaim
2 any responsibility to maintain the 60 foot working space?

3 A No, I didn't say that.

4 I was referring to operations and maintenance for
5 general pipeline activities. If we were to include
6 operations and maintenance for erosion control, reveget-
7 ation, soil stabilization, we would certainly carry
8 these out over the entire construction space and right-
9 of-way.

10 Q So that if there were some
11 environmental problem which was caused by construction,
12 which continued after construction was -- or became
13 apparent after construction was completed, you wouldn't
14 say to whoever owned that 60 foot right-of-way, that
15 is now your problem?

16 A No, I am sure we would
17 feel obligated to complete the clean-up activity and
18 the stabilization, because it's important for the pipe-
19 line, as well as for the environmental considerations.

20 Q Well I'm intrigued by
21 this because it appears to me to be a policy which is
22 really a distinction without a difference from Arctic Gas.

23 MR. GIBBS: I might remind my
24 friend that we were asked to say what differences there
25 were between the two, and this is one of the differ-
26 ences. Whether it's a credit or a debit on one side or
27 the other, is not what we are trying to bring before
28 the inquiry. We are pointing out merely that we expect
29 a 60 foot right-of-way, and Arctic Gas expects a 120
30 foot right-of-way. I don't know that there is anything,

Mirosh, Bauer, Walker, Glockner
Cross-exam by Mr. Bell

1 a great deal to be made out of that.

2 MR. BELL: Well I'm just
3 curious as to what the justification is for making this
4 proposal, and I thought perhaps this panel could help
5 me.

6 Q Can you offer me any
7 justification beyond what you have already said?

8 A In what sense?

9 Q well, does it make any
10 practical difference to you as an engineer whether or
11 not the 60 foot working space is owned by Foothills or
12 just used?

13 A Well I think the one
14 difference is that if we have activities going on over
15 the pipeline route, which require people to go over-
16 land in the winter time, or in the summer, then they
17 would try and confine their activities to the right-of-
18 way, which would be the 60 foot space, if at all
19 possible.

20 THE COMMISSIONER: At any rate,
21 until the completion of construction, both proposals
22 envisage 120 feet. After that, there may well be a
23 difference that is of significance.

24 Presumably Foothills would
25 relinquish any legal right it had to the 60 foot working
26 space, Arctic Gas would retain whatever interest it
27 sought in that 60 feet, but the obligations, in terms
28 of revegetation and so on, would persist in respect to
29 both companies, in respect of the 120 feet for both
30 companies. That is the point I am making. This is just

1 my impression of this.

2 MR. GIBBS: That's our under-
3 standing, sir.

4 MR. BELL: Yes, well what I
5 think I understand by what you are saying is that from
6 a practical point of view, you might as well own that
7 extra 60 feet, because your obligations towards it are
8 going to be the same, are they not?

9 MR. GIBBS: That is not really
10 accurate, sir. My friend is putting words into the
11 witness' mouth. Obviously if you own a hundred and
12 twenty feet, you feel free to roam in 120 feet, and if
13 you only own 60 feet, you confine yourself to 60 feet.
14 I'm sure my friend realizes that also, that is the
15 difference after the construction phase.

16 MR. MARSHALL: We are glad
17 that Mr. Gibbs has been able to give evidence, that
18 clarifies this point.

19 MR. GIBBS: Well I thought it
20 was so obvious, sir, that it wouldn't need clarification
21 but it appears to.

22 MR. MARSHALL: It's obvious
23 and it is transparent.

24 MR. BELL:

25 Q And I believe it was Mr.
26 Marshall who suggested that any revenues by way of
27 property tax, if I understood his question, would be
28 less if you owned only 60 feet, than if you owned 120
29 feet?

30 A I don't recall that

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Bell
Examined by Mr. Scott

1 question.

2 Q Well, is that the case?
3 Would that be your understanding?

4 MR. GIBBS: Again sir, I am
5 not fond of interrupting, but that again is a question
6 that is unanswerable. If the property tax is levied on
7 the iron in the ground, that is one thing; if it is
8 levied on the square feet of the right-of-way, that's
9 another thing. It's just not answerable.

10 MR. BELL:

11 Q Well would there be any
12 social-economic justification for making this distinct-
13 ion between what you owned and what you used?

14 A Well I think only insofar
15 as if we felt that we did not have to cut 120 foot
16 right-of-way or a 120 foot strip and we confined it to
17 100 feet in some places, there would be a side benefit
18 of allowing some stands of timber, some more stands of
19 timber, to remain in place.

20 Now, that's under the assumpt-
21 ion that if you had a 120 foot right-of-way, you would
22 clear the entire 120 foot right-of-way, which I think
23 you would do.

24 MR. BELL: Thank you. Those
25 are all the questions I have.

26
27 EXAMINATION BY MR. SCOTT:

28
29 Q Dr. Glockner, have you
30 read the evidence of Arctic Gas' design panel, or their

1 geotechnical panel?

2 WITNESS GLOCKNER:

3 A Evidence which was given
4 here?

5 Q Yes?

6 A Not in detail, no.

7 Q Well have you been through
8 it?

9 A I have looked at it.

10 Q Yes. Have you looked at
11 the portions of their application that relate to your
12 field of study?

13 A I have seen a preliminary
14 design which was done by Northern Engineering concerning
15 the analysis aspect.

16 Q Well let me ask you this:
17 Leaving aside the formula that was exhibited in your
18 schematics that were made exhibits, is it apparent to
19 you that there is any substantial difference of approach
20 between you and Arctic Gas, in the matters of stress
21 analysis?

22 A I don't think there is any
23 substantial difference, no.

24 Q All right. Well now, Mr.
25 Mirosh, I'm not quite sure I got the answer that you
26 gave to Mr. Marshall's question first this morning, which
27 was that in the example he put to you last night, with
28 the assumptions that were found in the schematic, you
29 and he concluded that there would be a permissible
30 deflection I think of three inches over 200 feet. Is

Mirosh, Bauer, Walker, Glockner
Examined by Mr. Scott

1 that correct? On the assumptions that were given to
2 you?

3 WITNESS MIROSH:

4 A Well I believe Dr.
5 Glockner concluded that, and I was observing his
6 calculation.

7 Q All right. The evidence
8 we've had is that not exactly the same length, but over
9 a comparable length, I think the deflections permissible
10 with respect to the Arctic Gas pipeline are one and a
11 half to four feet. Now, with those two contrasts, did
12 I understand you to say that if the assumptions that were
13 implicit in Dr. Glockner's analysis were correct, that
14 is had to be worked to, did I understand you to say
15 that it would not be possible to build a secure pipeline
16 and bury it?

17 A I don't recall saying that.

18 Q Well I thought I under-
19 stood you to say rather deflecting the thrust of Mr.
20 Marshall's question, oh well Dr. Glockner's assumptions
21 might be overly conservative. If those assumptions are
22 the correct ones, is it possible for you to build and
23 bury a secure pipeline?

24 A Well first of all I think
25 I did make the statement that they are extremely conser-
26 vative and I would like to re-emphasize that. Twenty
27 percent of S.M.Y.S.'s conservative, and I at this time
28 don't know how that compares to the CAGSL assumption,
29 where they may have had one or two feet of deflection.
30 They do have, of course, a different pipe. We would

Mirosh, Bauer, Walker, Glockner
Examined by Mr. Scott

1 have to look at the comparison which you are putting
2 forward, for me to make a further statement.

3 Q Well let me ask you this:
4 Take the assumptions as they are for the moment, and I
5 understand they may and undoubtedly will be refined as
6 experience develops, but take the assumptions as they
7 are. Are you confident that you can build and bury a
8 secure and safe pipeline?

9 A Yes, we are. We are
10 carrying out our studies and the point of Dr. Glockner's
11 presentation was not, I believe to show where a pipe
12 would fracture, that's the significant thing. Twenty
13 percent is an extremely conservative approach.

14 Q Let us assume that 20
15 percent is the optimum approach for the moment. Is
16 Foothills telling us ^{WITH} that assumption that they
17 can build and bury a secure and safe pipeline?

18 THE COMMISSIONER: Excuse me,
19 I lost you there. We went from conservative to optimum.
20 I don't know what optimum means.

21 MR. SCOTT: Well Mr. Mirosh,
22 as I understand it, dealt with Mr. Marshall's questions
23 by saying well that you don't have to worry about
24 because we are conscious that the assumptions are overly
25 conservative --

26 THE COMMISSIONER: Yes.

27 MR. SCOTT: -- and will be
28 refined. Now, be that as it may, those are the assumpt-
29 ions that have been presented to us, and I want to ask
30 you whether at this point in time, assuming that those

Mirosh, Bauer, Walker, Glockner
Examined by Mr. Scott

1 are the assumptions to which you must work, those are
2 the criteria, is Foothills confident that it can build
3 and bury a secure and safe pipeline?
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1 A Well, if we make a further
2 assumption at this particular situation which we have
3 assumed occurs only over an isolated situation, I'm
4 sure we could take the proper design steps to overcome it.

5 Q All right, well then do I
6 understand that if those assumptions are the correct
7 ones, there will have to be design modifications before
8 you will be confident that the pipeline can be securely
9 and safely buried?

10 A Well of course, the
11 material which Dr. Glockner presented did not show
12 any design considerations which would forestall frost
13 heaves, but I notice Dr. Glockner would like to add a
14 word. Could I pass on to him?

15 Q Well he's the expert, but
16 you're the engineer who's going to have to build it,
17 but by all means, let's hear what he has to say about
18 it.

19 WITNESS GLOCKNER:

20 A Thank you Mr. Chairman,
21 Mr. Commissioner. I am used to asking for permission
22 to talk. I know this is not the procedure in these
23 hearings. I would like to first of all state that there
24 was some statements made by the counsellor which I
25 would like to explain perhaps. The differences in
26 predicted deflections that you have referred to as one
27 or two or three feet, as opposed to three inches, are
28 only seeming differences. The 200 foot span that we
29 took in our example last night, resulted in a deflection
30 of 2.7 inches. Now if you took 1200 feet as some typical

1 examples were calculated in the C.A.G.S.L. preliminary
2 design reports, then you would come up with six times
3 that much which is roughly 18 inches. That's point
4 number one.

5 Point number two, nobody here
6 stated to my observation, including myself, that the
7 assumptions which were indicated on these graphs, are
8 the limiting and only assumptions that one can use in
9 the design and analysis of such a pipeline.

10 Indeed, if you are interested
11 in overcoming effects due to frost heave or settlement
12 which will produce larger displacements than a foot or
13 a foot and a half, then you have to take into account
14 the plastic deformations at points of high bending
15 moments in the pipeline. Such partial yielding
16 at local sections will permit displacements which are
17 of the order of several times those which we have
18 indicated on these curves and we are in the process of
19 generating such elastoplastic deflection curves, just
20 as I understand C.A.G. .L is doing that.

21 So that it is not correct to
22 say that this pipeline, when designed/ ⁱⁿ these assumptions
23 would not be able to stand up or will be safer or will
24 not be safe. These are one set of assumptions which
25 will demonstrate what I had hoped to demonstrate, how
26 one can calculate displacements in a pipeline when you
27 assume certain limiting conditions. Depending on the
28 conditions in the field you have various criteria,
29 which will allow you to determine whether the pipeline
30 is safe or not safe. It is my opinion that all the

1 predicted displacements which the pipeline will be
2 subjected to, what I have been given by geotechnical and
3 geothermal experts, all of those predicted displacements
4 can be safely withstood by the pipeline that has been
5 proposed by Foothills, taking into account plastic
6 deformation notations.

7 Q Let me ask this. Are the
8 assumptions that were given yesterday, going to be
9 relied on by Foothills in designing their pipe and their
10 line?

11 A I'll try to repeat myself
12 sir. The assumptions which were stated in connection
13 with these problems were assumptions limiting the state
14 of stress in the pipe to initial yield in the outer
15 fibres of the pipeline. These are elastic calculations
16 as the diagrams say. These are not the conclusive or
17 restrictive assumptions which are used in the total
18 design of the pipeline.

19 Q Are those assumptions going
20 to be varied in the future?

21 A These are part of
22 assumptions and are used in part of the calculations
23 at certain sections where it is found that the
24 deflections are small enough so that they can be withstood
25 by the pipe without deforming into the plastic region.

26 Q Well would it be correct
27 to say just so I can understand at least a bit of what
28 we're discussing, that unless there is further refinement
29 which there may be, that the assumptions that you have
30 given yesterday will be the assumptions that will be

1 utilized, otherwise I find it difficult to understand
2 why they were presented to us?

3 A I have the same difficulty
4 so I can understand I don't understand this question.
5 Maybe you can repeat it once more.

6 Q Well you have presented
7 certain assumptions which Mr. Marshall has utilized to
8 produce the extent of deflection in a certain length of
9 pipe. Now Mr. Mirosh has said that those assumptions may
10 be refined by further work or further experience as the
11 project moves ahead. Do I understand that at the moment
12 in time those are regarded as correct and accurate
13 assumptions?

14 A Well portions of the pipeline
15 as I said were the deformations are so small that they
16 will keep the strain of stress within the elastic state.
17 Those assumptions are correct. In other portions, the
18 deflections are expected to be larger, you have to
19 use different set of assumptions.

20 Q Well now, on the subject of
21 the right of way, Mr. -- I'm not quite sure who should
22 respond to this, but I see in your application that
23 3b2.2 you describe the 60 foot right of way and the
24 60 foot construction zone, and then you say, a minimum
25 200 foot wide construction zone will be required at
26 river and waterway crossings. Now is that 200 foot
27 wide construction zone in addition to the 60 foot right
28 of way or does it include it?

29 WITNESS MIROSH:

30 A Well it could include it

1 and it could, in some instances, perhaps require a
2 little more.

3 Q Well do I understand
4 from that then that in some instances, at river crossings,
5 you will require a work zone which will be an expression
6 I will use to avoid the problem of right of way versus
7 work zone, that will be up to 280 feet wide?

8 A Possibly.

9 Q And that will require
10 in the worst case. a full clearing of the right of way?
11 Of the 280 feet.

12 A It would require clearing in
13 the work zone, yes.

14 Q And you go on in that
15 same statement to say, and I should read the whole thing
16 to you to be fair, "a minimum 200 foot wide construction
17 zone will be required at river and waterway crossings,"
18 and I take it that that means virtually all river or
19 waterway crossings?

20 A No.

21 Q Well what is the qualification
22 you want to add to the application?

23 A Major.

24 Q All major. All right.
25 "Or in terrain where the use of conventional highway
26 equipment is prohibited." Now stopping right there, do
27 I understand that to mean that in that kind of terrain,
28 you will need or you may need up to 280 feet?

29 A Yes. that could be
30 possible or that statement could also refer to access

1 roads which were shown on our alignment sheets which
2 would be required outside of the right of way.

3 Q Well it's your statement,
4 not mine and I take it it does mean, does it not, if it
5 means anything. that where you have that kind of terrain,
6 you may need. I'm not saying you must need in every case,
7 but you may need up to 280 feet.

8 A We may.

9 Q Yes, and when it says that
10 that will be required where the use of conventional
11 highway equipment is prohibited, do I understand pro-
12 hibited to mean impossible or undesirable?

13 A Either in terms of grade
14 or environmental constraints.

15 Q Yes.

16 Have you given any consideration
17 to the extent of your route which may fall within that
18 category.

19 A We've certainly thought
20 about it, to the extent that we have shown access roads
21 which would be required to get over grade on our
22 alignment sheets. We also are looking forward to
23 completing our orthophotomosaic studies which will then
24 allow us to make the refinements which you're referring
25 to.

26 Q What I'm concerned to get
27 at is the state of your present knowledge and you have
28 indicated that apart from the major water crossings, you
29 may need up to 280 feet in terrain where engineering
30 necessity or the unsuitability of traditional highway

1 vehicles or environmental considerations require the
2 additional space and what I really want to know. is
3 have you any estimate whatever of the percentage of
4 the route, even in rough terms, that may fall into this
5 category?

6 A Well I think in terms of
7 major river crossings we stated previously that there
8 are perhaps a dozen which we consider fall into this
9 category. In terms of on right of way, I can't give
10 you an answer right now.

11 Q Is there anyone on the
12 panel who has any idea of the percentage of the route
13 that may require this width?

14 A As I stated earlier, we
15 are carrying out the orthophoto studies and these of
16 course, give us contours of the entire route which we
17 can then assess in the office. This combined with
18 geotechnical and environmental personnel working on the
19 orthophotos will allow us to make these studies.

20 Q What environmental con-
21 siderations do you have in mind that will necessitate or
22 may necessitate a working width of 260 or 280 feet?

23 A I think that would probably
24 be restricted to grade considerations.

25 Q I see. Have you any idea
26 of the number of grades on the route that may require
27 this width or something in excess of the 60 plus
28 60?

29 A No sir.

30 Q Have you any idea what

1 vehicles will be utilized in place of the conventional
2 highway vehicles?

3 A For construction?

4 Q Yes.

5 That will fall within the
6 ambit of that sentence.

7 A You mean other than
8 conventional highway vehicles?

9 Q As I understand you, you
10 have held open the possibility that where you're unable
11 to use conventional highway equipment, you may need a
12 working area, you may need a working area up to 280
13 feet. Now what is the equipment that you're talking
14 about that is not conventional highway equipment that may
15 trigger that necessity?

16 A Well that statement is
17 geared primarily towards grade difficulties where conven-
18 tional pipeline equipment as well as highway equipment
19 will have to negotiate grade and we may need zones of
20 extra space in order to get around grade if we want to
21 eliminate the possibility of creating an access road
22 that goes right off the right of way.

23 Q Well would it be correct
24 to assume then that in any case where you may need other
25 than conventional highway equipment, this risk of
26 expanded work zone is possible?

27 A Well, there no doubt will
28 be areas where we will need more work zone, yes.

29 Q Now in looking at your
30 alignment sheets, I see that in many places you have

1 shown and marked off right of way access roads. Are
2 these what are sometimes referred to as shoo fly roads?
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

A Yes, in some instances they are.
They are also access roads to

borrow pits, wharf sites which probably would not be
called Shoo-flies.

Q Well in areas where there
is a Shoo-fly road shown on your alignment sheet, how
wide a right-of-way and construction zone do you think
you will require, the full 120 feet or something less?

A No sir, it would probably
be less than 60 feet.

Q So do I take it that in
cases where the Shoo-fly road is shown as immediately
adjacent to the right-of-way, that it will amount to a
reduction of your work zone rather than an addition to
it?

A Well it may, depending
on the local topography.

Q Well I notice on the
alignment sheets of Arctic Gas with one or two except-
ions, perhaps, they have not shown Shoo-fly roads.
Would this be regarded in your judgment as a distinction
between the two applications?

A Yes, it would be. I'm
sure they will require some off right-of-way access.
We have assumed that they would.

Q I have to apologize. My
examination is, as you would say I think, in a syner-
gistic state because of the work that my friends have
done. I take it that --

MR. MARSHALL: I'm sure that
not everyone understood the meaning of that term.

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 THE COMMISSIONER: As you would.
2 say, it's obvious and transparent.

3 MR. SCOTT:

4 Q I take it, I'm not quite
5 sure I understood the answer to Mr. Bell's question, but
6 I take it with respect to the 60 and 60 foot or the
7 expanded area up to 280 feet or the Shoo-fly roads, it
8 is within the plans of Foothills to maintain responsi-
9 bility for those areas, as long as may be necessary to
10 restore them to something approximating their original
11 state?

12 A Yes, I'm certain this
13 would be our obligation.

14 Q Well now, in the answer
15 to question 4 in the second paragraph, you deal with
16 the question of frost heave and you attempt to define,
17 as I understand your answer, the characteristics of the
18 area in which the problem is likely to exist or appear.
19 Do I have that right?

20 A Yes.

21 Q I want to ask you if you
22 today have any preliminary assessment of how many miles
23 or the proportion of the pipeline route that have a
24 potential for frost heave?

25 A We do have this. I don't
26 have it here.

27 Q Who would have that?

28 A I think the geotechnical
29 panel would be a logical group to refer that to.

30 Q Right. Now, in the next

1 paragraph, the answer to question 4, you talk, as I
2 understand it, about design steps to limit pipe movement
3 due to frost heave if the movement will exceed those
4 which we can tolerate, and you express your capacity
5 to tolerate in terms of pipe integrity. Have I read
6 that correctly?

7 A Yes.

8 Q Well now, what I want to
9 know is you apply similar measures in cases where
10 frost heave may have no pipe integrity consequences but
11 will have environmental consequences.

12 A I'm sorry, I didn't get
13 the full question.

14 Q Well let me ask you this:
15 Can you conceive of a situation in which the potential
16 for frost heave may have no consequences in terms of
17 the, or no major consequences in terms of the integrity
18 of the pipe or the integrity of the supply, but may
19 have consequences in environmental terms?

20 A Yes, I suppose from a
21 hydrological sense, drainage patterns could be affected.

22 Q Well now, is that some-
23 thing that you have presently considered in determining
24 the amount of pipe heave you can tolerate, or is it
25 something that remains to be done?

26 A Well the whole aspect of
27 drainage and erosion control has been given a great
28 deal of attention by us, but to be specific, about frost
29 heave effects on drainage patterns, I would think this
30 is something to be done. However, the whole area of

1 drainage and erosion control, as I say, has received a
2 great deal of attention.

3 Q Well let me put it this
4 way: Have your environmental consultants examined and
5 approved the solutions with respect to frost heave,
6 from their particular point of view?

7 A Well they haven't because
8 in fact our solutions are in the making.

9 Q I take it that what you
10 are saying is that at the present point in time, there
11 are no solutions to present to them in sufficiently
12 final form that they can analyze whether they meet
13 environmental concerns, and that remains to be done.

14 A It depends on whether you
15 are talking about solutions to the mathematical problem
16 of determining how much frost heave will occur, or
17 solutions to the frost heave problem on pipe. Dr.
18 Glockner is concerned about the effect of frost heave
19 on pipe, but at the same time and at a stage of develop-
20 ment, we are carrying on quite separate studies related
21 to the amount of frost heave which would occur. Quite
22 irrespective of what we have to do to protect the pipe
23 if it might exceed pipe limits.

24 This work is not at a complete
25 stage yet, it's at an intermediate stage, and I think
26 that the geotechnical panel will be able to bring you up
27 to date on our work there.

28 Q Well let me ask you this.
29 For the moment, I'm quite confident that Dr. Glockner
30 will tell you how you can predict frost heave, I'm quite

1 confident that Foothills' own people will determine how
2 to respond to frost heave from a pipe integrity point of
3 view. It's your pipe and you obviously want it to ship
4 gas. What I'm concerned about is have any of the tent-
5 ative design suggestions been put to the environmental
6 people to ascertain whether those design solutions or
7 suggestions are adequate from the point of view of their
8 environmental concerns relating to frost heave?

9 A Yes, of course. I could
10 use the word synergistic again.

11 Q Maybe you had better not.

12 A There is a continual inter-
13 change of information in the form of meetings and dis-
14 cussions between our environmental people, our geotech-
15 nical people, our hydrological people, so that to that
16 extent the environmental input affects decisions at a
17 very early stage before they get carried on into
18 solutions.

19 Q Well first of all, who
20 are your environmental consultants on this question?

21 A Well a company called
22 Lombard North, which is reporting directly to Mr.
23 Bouckhout of our company.

24 Q All right. Well have
25 your frost heave designs, or the designs that are in
26 the works to mitigate frost heave, been shown to them?

27 A No, because they are at
28 an intermediate stage of development, but when they are
29 complete, these will certainly be discussed.

30 Q I see. That work, in

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. scott

1 essence then, is ahead of you?

2 A Well it's ahead of us and
3 it's with us. We've been working on it for a while and
4 we're at a stage intermediate to completing it.

5 Q What I'm getting at, are
6 Lombard North going to come along and say that they have
7 approved your design solutions with respect to frost
8 heave, or is it too early for that?

9 A Well, of course the work
10 that's in progress, you know, is attempting to predict
11 the amount of frost heave. This work does not neces-
12 sarily imply a solution, because what we will do is find
13 that in certain situations the frost heave is predicted
14 to be what we would consider at least for the pipe
15 integrity, not significant. Lombard North will be given
16 that data, along with Klohn Leonoff as it appears to
17 determine whether for drainage and soil erosion control
18 it's significant.

19 Q Well now in question 4
20 you also deal with thaw settlement, and the evidence as
21 I read it, says quite simply that thaw settlement will
22 occur in those areas to the south of Fort Simpson,
23 where the warm pipeline passes through fine-grained
24 ice rich permafrost soil. Now, as I understand your
25 application as opposed to Arctic Gas', quite a substan-
26 tial length of your line, all that south of Fort
27 Simpson, and the Yellowknife lateral of about 500 miles,
28 are -- will not be chilled.

29 A Yes, I would qualify that
30 to the fact that the Yellowknife lateral portion, the gas

Mirosh, Bauer, Walker, Glockner
Cross-exam. By Mr. Scott

1 contained within the pipeline will very quickly attain
2 ground temperature and will be chilled by the ground, in
3 fact, to stay at that temperature.

4 Q Well bearing in mind that
5 the very great length of pipe in which this phenomena
6 will be at least potential, have you any estimate of the
7 proportion of that section of pipe that -- where it may
8 be a problem?

9 A I don't have it here, but
10 again I would refer that to the geotechnical panel who
11 have, I am certain, looked at that.

12 Q Well now again in your
13 analysis, or in your answer to the question about thaw
14 settlement, you have related your answers to the inte-
15 grity of the pipe. To what extent, at this moment,
16 has the problem of thaw settlement been passed on by
17 your environmental advisors?

18 A Well first of all, I
19 think it's fair to relate these questions to the inte-
20 grity of the pipeline, because really the two go hand-
21 in-hand, the environmental integrity and the integrity
22 of the pipeline. My answer specifically to your quest-
23 ion about where we are as far as environmental input
24 goes, is we're at the same stage as we are with frost
25 heave. This is work which is currently being carried
26 out at the same time as frost heave work is, and again,
27 our environmental people are meeting with the geotech-
28 nical people and others to discuss these, at the present
29 time, and their input comes in at a very early stage.

30 Q But I take it, Mr. Mirosh,

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 that you can see that there are, both in the frost heave
2 areas and in the settlement area, matters that may not
3 affect integrity of the pipe which will nonetheless,
4 affect environmental concerns?

5 A Well I think that the
6 integrity of the pipe and environmental concerns go
7 hand-in-hand. If one restricts it to the soil, and the
8 support that one has of the soil, and if one further
9 qualifies that by stating that we are planning and have
10 planned to take erosion control, soil stabilization
11 measures after construction, revegetation.

12 Q No, but you are not
13 suggesting that if all the pipe integrity problems are
14 resolved with respect to frost heave and settlements,
15 that ergo all the environmental concerns will be
16 resolved?

17

18

19

20

21

22

23

24

25

26

27

28

29

30

1 A It would seem to me those
2 related to soil in a large measure would be.

3 Q Well how about the others?

4 A Well I can't immediately
5 think of any others related to the living environment
6 that would be affected.

7 Q All right, in any event,
8 I take it that with respect to settlement, your input
9 to the environmental consultants is at about the same
10 stage as it is with respect to frost heave?

11 A Yes, it's at an inter-
12 mediate stage following a great deal of work and
13 there will be more work of course.

14 Q In the answer to question
15 four, before we pass onto that, are there not soil
16 settlement problems that exist north of Fort Simpson
17 as well?

18 A During the period of
19 construction --

20 Q I'm sorry yes.

21 A During the summers after
22 the winter construction period. there are quite different
23 situations which will occur. The ditch line will thaw
24 to a degree.

25 Q Are there not thaw problems
26 north of Fort Simpson that will occur not only before
27 start up but after start up?

28 A Well I can't think of any
29 because of the fact that the gas would be refrigerated
30 but perhaps you could point these out.

1 Q I take it if there are any,
2 you personally have no estimate of the extent of the area
3 that may be affected by them. That's for some other panel.

4 A Well I'm not sure which
5 problems you're referring to, would they be related to
6 other facilities other than pipeline?

7 Q Well let's deal with
8 settlement problems north of Fort Simpson before start up.
9 What percentage of the line or how many miles of the
10 line north of Fort Simpson are going to be affected by
11 this?

12 A Well I guess one would have
13 to say that continuous permafrost zones which would
14 be from Fort Good Hope north, and the pipe in that
15 part of the ditch, would be subject in the summertime
16 to some thaw which would reconsolidate during the
17 subsequent winter. That doesn't seem to present us
18 with a problem. As to the portions south of Fort Good
19 Hope and to Fort Simpson, I'm not certain of the percen-
20 tage of permafrost in that area, which would be subject
21 to thaw in the summertime and eventual freezing again
22 in the winter.

23 Q So I take it that you
24 have no estimate of the extent in that area that may be
25 affected?

26 A I don't have it here but
27 we do have certainly assessments of that and I again
28 would refer that to the geotechnical panel.

29 Q Now in your answer to
30 question four, at the very bottom of the last page,

1 dealing with question four, you say "should specific
2 areas of concern regarding pipe support become evident,
3 during the studies, designs based upon the installation
4 of special pipe support structures could be implemented."
5 Now, this appears to me as potentially opening an area
6 of difference between one application and the other,
7 what are the special pipe support structures that are
8 contemplated? What are they?

9 A Well in a very general
10 sense, it would be some form of a pier with a cross
11 member which would support the pipe, if we found that
12 they were needed at any area of loss of support due to
13 soil.

14 Q What is the pier going to
15 be made of?

16 A It could be partly con-
17 crete, partly steel,

18 Q And this will be placed
19 in the trench?

20 A Below the trench. Drilled.
21 With a cross member across the bottom of the trench, I
22 would suspect.

23 Q Have these special
24 pipe support structures as they're called, been designed?

25 A No sir.

26 Q Have they ever been used
27 as far as you know in permafrost terrain?

28 A No, I'm not aware of any
29 other pipelines in permafrost but I think the reason for
30 putting this in is that it seems like a possible solution.

1 Q But I take it at the moment
2 it is nothing more than that, an idea that may potentially
3 hold the solution for a problem?

4 A Yes, but from an engineering
5 point of view it's not a difficult idea to imagine.

6 Q Now on the subject and
7 it will only take a moment, of block valves, I understand
8 that one of the functions of the block valve is to present
9 the loss of gas, but I take it that also another function
10 is to prevent the extension of a fire or an explosion?

11 A Well this would certainly
12 be associated with loss of gas due to a rupture in the
13 event that there was a fire or explosion.

14 Q So that the presence of
15 a block valve in a pipe where it would be necessary,
16 really serves two purposes, one an economic purpose, to
17 prevent the loss of gas and secondly an environmental
18 or social purpose to minimize or reduce the impact of
19 an explosion or a fire.

20 A You could argue that way.

21 Q Well there isn't any doubt
22 about that, is there?

23 A I suppose not.

24 Q I didn't understand Arctic
25 Gas to concede that their pipeline was going to rupture
26 or break, and I don't understand you to concede that
27 either, but I put it to you that in the event that your
28 pipeline ruptures or breaks, and a fire or an explosion
29 occurs, a block valve may serve a useful purpose in
30 containing the explosion or the fire.

1 MR. GIBBS: Well I think my
2 friend should define where the explosion is going to
3 occur. It's right beside or just after a compressor
4 station it's one thing, but halfway in between it's
5 still another. This is not a sufficiently defined
6 question.

7 THE COMMISSIONER: Let's take
8 halfway between. alright?

9 MR. SCOTT: All right.

10 A I'm sorry, I was listening
11 to something else.

12 Q I think you should have
13 been listening to Mr. Gibbs, but I put it to you that
14 in the event that an explosion or a fire as a result of
15 a rupture of the pipe occurs, halfway along the pipeline,
16 between the stations, that it is conceivable that the
17 presence of a block valve will reduce the extent of the
18 fire or the impact of the explosion.

19 A Well it would probably
20 reduce the duration of the fire if one assumes there
21 was one, but it would likely have no effect on the
22 size of this fire.

23 Q How about an explosion?

24 A I see that it would have
25 no relationship to an explosion.

26 Q Well then what are these
27 people talking about when they tell us that block valves
28 are safety features? You conceded that that was one of
29 their functions. How do they protect safety then?

30 A Well by closing and

1 isolating half a line section, the idea is that they
2 would explose less gas to the atmosphere, either to be
3 disbursed or burned, but this is a duration effect, not
4 a size effect of the area of the fire.

5 Q All right. Well in the
6 event that there is difficulty on your line, I take it
7 that a block valve may serve some useful purpose in
8 containing or restricting the damage or the danger?

9 A Yes, if a block valve was
10 installed and if we used the scenario you've presented,
11 then the duration of gas escape ^{be it} into the atmosphere or
12 as a fire would be somewhat less. but it's not a
13 linear relationship.

14 Q Well let me put it this
15 way. In the event of a rupture of the line or trouble
16 on the line, is there any safety feature that has been
17 sacrificed by the determination not to have block valves?

18 A I can think of none.
19 If I might just make one comparison, to set the size of
20 such an occurance in perspective, the Arctic Gas proposal
21 does contain block valves, which sectionalizes their line
22 into 20 or 25 mile segments, with the larger diameter
23 and higher pressure, the volume of gas in their 20 or
24 25 mile segment is virtually equivalent to the volume
25 of gas within our -- with the lower pressure and smaller
26 diameter. 50 mile segments, so that in that sense, block
27 valves or the absence of block valves if one was to
28 compare the two, we're talking about the same impact on
29 the environment if there is any. If we were to install
30 block valves, ours would of course be somewhat reduced

1 from that.

2 Q Are there other large
3 diameter Canadian pipelines that have intermediate block
4 valves?

5 A Yes, the Alberta Gas
6 Trunk Line system installs them.

7 Q In installing them is it
8 ever advanced that they have some safety virtue?

9 A They have been a requirement
10 of the Code. I'm not certain that there is a safety
11 element associated with them.

12 THE COMMISSIONER: What purpose
13 do they serve on the A.G.T.'s

14 A Well I think the primary
15 purpose on such a system as A.G.T L. is to assist in
16 pipeline looping operations where a system such as that
17 grows year by year, for pipeline looping one doesn't
18 have to evacuate the amount of gas that one would
19 normally have to do if he didn't have block valves.
20 That's one of the reasons, I believe pipeline companies
21 generally install them.

22 MR. SCOTT:

23 Q Mr. Mirosh, I don't understand
24 then why you so quickly perhaps too quickly answered
25 my questions when I said they had a dual purpose. When
26 I said they had a dual purpose, when I suggested they had
27 a dual purpose one of which was a safety feature.
28 You seem now to have come around to the proposition that
29 they don't have any safety virtue whatever?

30 A Well they do to the extent

1 that if one considers escape of gas into the atmosphere
2 under a rupture situation a safety hazard, then one can
3 limit the amount of gas by installing block valves.

4 Q You do not consider it,
5 on this particular pipeline a safety or environmental
6 hazard?

7 A Well again, third party
8 damage is something that we know statistically --

9 Q Please tell me that the
10 pipeline isn't going to break because this whole
11 assumption is predicated on the fact that it is.

12 A Well if we were to assume
13 the pipeline was going to break, and if there was an
14 overriding environmental or safety requirement, then
15 we would put them in.

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 Q And all safety devices
2 are devised and implemented on assumptions such as that,
3 that the pipeline 'is going to rupture?

4 A Yes.

5 Q Has this decision been
6 approved by your environmental or socio-economic con-
7 sultants?

8 A I don't think that I could
9 say that we had specifically discussed it with them.
10 We have all, I guess, read the report on explosive
11 effects that was written by someone in the federal
12 government, and I guess our approach initially on this
13 was that we are not, by eliminating block valves, pro-
14 posing anything different from the point of view of
15 escape of gas in the CAGPL application.

16 Q Well now, Mr. Bauer,
17 about the construction techniques that you described,
18 I understand your answer to indicate that Foothills
19 intends to bend the pipe before the ditch is dug instead
20 of after, is that correct?

21 WITNESS BAUER:

22 A That is correct.

23 Q And I take it that that
24 distinguishes the procedure from Arctic Gas, who intend
25 to dig the ditch first and then bend the pipe?

26 A Well I shouldn't say it
27 distinguishes anything, it's merely that is the reverse,
28 or what I call a reverse process, is to prevent the
29 ditch from filling with snow in winter time.

30 Q But I take it that you are

1 familiar with the CAGPL application and the procedure
2 that they suggest?

3 A Yes, I am.

4 Q And I take it that this
5 is a point of difference between your procedure and
6 theirs?

7 A Well I would say it is a
8 very minute difference, in my opinion.

9 Q But I take it that the
10 explicit condition of your procedure is that you will
11 dig a ditch to certain specifications?

12 A Yes.

13 Q And then when it is opened
14 you will have the pipe already bent so that it can be
15 immediately installed?

16 A Well the procedure will be
17 we strain the pipe, we weld the pipe and dig the trench,
18 and suit the bottom of the trench, in other words, the
19 pipe, we suit the bottom of the trench to the pipe.

20 Q Yes, so that in that pro-
21 cedure, there must be an exact mesh between the design
22 of the proposed trench and the bends that you have
23 already incorporated on the ground?

24 A Yes.

25 Q You won't have the flexi-
26 bility that another pipeline company might have if they
27 said "Well, we will dig the trench, we will see what's
28 in there, we'll see what the problems are", and later
29 on we will bend where necessary, to accommodate those
30 problems".

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 A No, we still have all the
2 flexibility that one must have during construction.

3 Q No, but I take it that
4 your design specification for the trench must be highly
5 accurate or you will have bent a pipe that will have to
6 be rebent?

7 A No, because, you see to
8 produce a safe -- a good, to stay within common pipeline
9 practices or good pipeline practices, you design the
10 trench to suit the pipeline, therefore, you have all the
11 flexibility one must have or should have.

12 Q Well let me ask you this:
13 After you have bent the pipe, is it possible to rebend
14 it if the actual ditch profile cannot be completed as
15 planned?

16 A Well you correct in the
17 ditch, not in the pipe.

18 Q No, but I take it then
19 that you cannot rebend the pipe?

20 A It wouldn't be practical.

21 Q All right, so that every-
22 thing depends on being able to complete the profile of
23 the ditch that you have predicted on your drawing
24 boards?

25 A Well if we put it that
26 way, based on your detailed sub-soil investigations.

27 Q Yes, so that if you pre-
28 dict your design incorrectly at any given location,
29 you're going to have a pipe that is already bent to a
30 design that cannot be achieved?

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 A No, because we will keep
2 the trenching to such a degree that, in other words,
3 minor modification in the field can be made and must be
4 made.

5 Q Do you contemplate any
6 circumstance that will occur that the pre-designed
7 trench cannot be completed and more than a minor modi-
8 fication is required?

9 A I say we will have to go
10 along the way we dig the trench, that is just common,
11 good pipeline practice.

12 Q Well is my question
13 capable of an answer? Do you contemplate any situation
14 in which the pre-design of the trench cannot be com-
15 pleted, and a minor modification will be insufficient?

16 A That's quite possible.

17 Q What are you going to do
18 then?

19 A Then you have to make the
20 corrections as required.

21 Q And I take it that means
22 you have to dig a new trench to a new design, or you
23 have to bend another piece of pipe to go in it?

24 A Well in most cases you
25 would be able to make the correction in the trench
26 itself.

27 Q Now in your answer to
28 question 13, and perhaps you can turn to that, you
29 refer to a number of factors that I gather will go into
30 your ditch specifications, an extra deep ditch, removing

1 the frost susceptible material to control frost heave,
2 you also refer to ditch specifications "for the various
3 conditions of permafrost, potential frost heave and
4 normal soil and reflecting cross drainage requirements,
5 erosion control, revegetation and replacement of top
6 soils, to permit crossing requirements and slope
7 stabilization," and I take it that these are factors
8 that will have to be weighed, considered and evaluated
9 before the ditch specification for the given area is
10 established?

11 A That is correct.

12 Q Will it be possible for
13 you to provide us with an example, either here or on
14 the construction panel, of such a ditch specification
15 for a particular section, any section, of the pipeline?

16 A They are in the prepara-
17 tory stage but they are not finalized, by no means.

18 Q The point I am getting at
19 is that it seems to me that if the ditch comes last,
20 you have to -- you have invested heavily in your ability
21 to predict with precision, what will be found when the
22 trench is dug.

23 A Yes that is true, but
24 again a specification is merely a guideline for the man
25 in the field, and the final decision is usually made
26 when the trench is opened.

27 Q Well Mr. Bauer, I would
28 agree generally, but isn't it more than a guideline if
29 you have already bent the pipe?

30 A Well --

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 Q -- because then you will
2 be forced, will you not, with the alternative either of
3 bending another piece of pipe or jamming it in there
4 anyway?

5 A Well the common practice
6 is not to go ahead and bend pipes as may seem to be
7 fitting, so in other words, in most cases the pipe is
8 being bent when the trench is opened, in most cases so
9 therefore we have a greater flexibility.

10 Q Well then would you agree
11 with me that it would not be correct to say that you are
12 going to bend the pipe before the ditch is dug, you're
13 going to do what everybody else does, you're going to
14 dig the trench and bend the pipe when you see what's in
15 the ground?

16 A That's about the size of
17 it.

18 Q And I take it that in that
19 circumstance, the ability to predict with precision
20 whether the ditch specifications can be achieved, becomes
21 less important because in the act of bending the pipe,
22 you can take account of differences you find?

23 A Right.

24 Q And just so I'll have it
25 clearly, I take it then that we may assume that you're
26 not going to do any bending of pipe until the ditch has
27 been dug?

28 A Except where we know a
29 bend has to be made.

30 Q And you're going to know

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 that by your ditch specifications?

2 A No, by the accounts of
3 the ground, of the terrain. The sub-soil investigations
4 are the detail for the design that is required prior to
5 going into final design, will give us a better gradient
6 picture what is to be expected, and as I stated before,
7 we try to eliminate bending wherever practically
8 possible, so therefore we have, to some degree, a good
9 idea where bends may be or bends will be adopted.

10 Q Well, do I understand that
11 in the bulk of the route you will do no bending until
12 the ditch has been opened, exposed and examined?

13 A In most cases, yes.

14 THE COMMISSIONER: Well it's
15 12:30. I think this is our usual time of adjournment.
16 Would it be all right to adjourn now? You must be close
17 to --

18 MR. SCOTT: I am nearly almost
19 finished.

20 THE COMMISSIONER: Well we
21 will hear your remaining questions at 2, and then we
22 will carry on with the next panel, if it is available.

23 MR. GIBBS: We will be ready
24 to proceed, sir.

25 THE COMMISSIONER: All right,
26 we will adjourn until 2 then.

27
28 (PROCEEDINGS ADJOURNED)
29
30

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. SCOTT:

3 Q Mr Bauer, would it be
4 possible for this panel to provide or to provide to the
5 construction panel, a ditch specification for a sample
6 area of your selection?

7 A We don't have a ditch
8 specification prepared as of yet.

9 Q Well is it possible to
10 prepare one in prototype showing the kind of things
11 that will be shown and the way they will be quantified
12 and described?

13 A I would have to refer
14 that question to Mr. Mirosh.

15 WITNESS MIROSH.

16 A Well in view of the fact
17 that the construction panel will probably be up this
18 week I don't think we'll have time to prepare this for
19 you, for that event.

20 Q Well I'd appreciate it
21 if you could prepare it and let us have it at whatever
22 time is reasonably convenient to you.

23 A I think we could prepare
24 a prototype which may not contain all of the elements
25 but which would signify our approach.

26 Q Well now, do I understand
27 that the contour of the ditch is going to be altered
28 where necessary by various techniques of padding and
29 bedding that you've described in your evidence in chief.

30 A Are you directing that

1 question to myself or Mr. Bauer?

2 Q Either one.

3 WITNESS BAUER:

4 A Yes, that is correct.

5 Q Is it likely that larger
6 amounts of bedding or padding will be required than
7 would be normal if the technique of bending after ditching
8 was applied?

9 A Not necessarily.

10 Q Have you any view on the
11 relative proportions utilizing one technique as against
12 the other?

13 A We never made any compari-
14 son.

15 Q All right, have you made
16 any estimate of the volumes of bedding and padding that
17 will be required using your method of burying the pipe?

18 A Yes we made an estimate
19 as far as overall requirements.

20 Q Well is there in your
21 application, an estimate of the volumes of bedding and
22 padding that will be required apart from telling us
23 where you're going to get them?

24 A I believe there's a
25 general statement.

26 WITNESS MIROSH:

27 A The construction plan
28 drawings in the application do show our borrow requirements
29 in some detail as we understood them to that point.

30 Q Have you made any inquiries

1 to determine whether the volumes and types of bedding
2 and padding material that you require are available
3 to the sites where you will require them?

4 A We've had available to us
5 the drill information and borrow inventory information
6 which has been accumulated for both the Mackenzie
7 Highway and for early study group work and basing our
8 understanding on these informations. we understand that
9 there is sufficient borrow .

10 Q Are you going to develop
11 processing plants to translate the borrow into the
12 appropriate bedding and padding equipment?

13 A We have allowed for some
14 processing of borrow yes.

15 Q How many processing
16 plants do you anticipate setting up?

17 A That number I don't have
18 with me.

19 Q Have you any guestimate?

20 A Probably it would be
21 better to treat that one with the construction planning
22 panel.

23 Q All right. Now, in
24 question number 6, and I think Mr. Mirosh dealt with
25 this if I'm not mistaken, perhaps Mr. Walker, at the
26 very end, you indicate that you are not discounting the
27 possibility of installing overhead river crossings
28 at specific locations where this is indicated to be
29 preferable during the detailed design study. The
30 first thing I would like to ask you, is can you envisage

1 any engineering situation in which overhead crossings
2 would be determined to be desirable?

3 A From an engineering point
4 of view solely?

5 Q From an engineering point
6 of view.

7 A Yes, I think in some
8 instances if that was the only factor considered they
9 may be desirable.

10 Q What would be the factors,
11 in an engineering sense that would work in favour of
12 overhead crossings?

13 A One of the major factors
14 would be the amount of earth moving which may have to be
15 carried out on the banks of a particularly steep creek.

16 Q Any other factors occur to
17 you or any other members of the panel?

18 A.s Well coupled with the
19 earth movement, there is bank stability considerations
20 and erosion considerations and the extent to which these
21 would have to be applied. In the event of an underground
22 crossing.

23

24

25

26

27

28

29

30

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1
2
3 Q Mr. Walker, do you have
4 anything to add to that list of factors which might, in
5 an engineering sense, move you toward overhead costs?

6 MR. WALKER:

7 A Well I think there could
8 be other factors. Access or disturbance to the area
9 might be one.

10 Q Well I just want to deal
11 at the moment with engineering.

12 A I'm referring to engineer-
13 ing.

14 Q Yes, all right.

15 A You may have a very diffi-
16 cult area in which to get down into to lay the pipe,
17 and hence it may be from an engineering viewpoint,
18 easier to span or go across.

19 Under Arctic conditions, I
20 would strongly recommend limiting the overhead crossings
21 though, rather than going above. They are used in the
22 south perhaps more frequently than I think they would
23 be in the Arctic.

24 Q Let me ask you this --
25 but before I do, are there any other engineering
26 factors that you would want to examine in determining
27 whether you should move to overhead crossings in any
28 given location, apart from the ones you have already
29 given me?

30 A You said move from

1 overhead crossings?

2 Q To overhead crossings,
3 apart from the ones you have already given me?

4 A Engineering always has to
5 consider cost factors, and the only cost factors that I
6 can think of that would put you into an overhead cross-
7 ing is fundamentally a higher cost for a submerged
8 crossing than an overhead one, and I can't see this
9 occurring unless it's a narrow span in a steep valley or
10 canyon, and then possibly you could have an overhead
11 crossing.

12 Now have you -- I'm sorry, go
13 ahead.

14 A There could be factors
15 relative to gas temperature that could affect this,
16 which -- in which the ambient temperature conditions
17 would have a situation occurring on the pipeline itself,
18 the gas in the pipeline itself.

19 Q Now, have you reached the
20 stage where you have determined whether you should look
21 at overhead crossings at any of the rivers, major or
22 minor, that are on the route?

23 A Well in the work to date
24 that we have done for Foothills, we have looked at
25 preliminary designs on two major crossings, which I
26 mentioned earlier, plus about a dozen others which were
27 classified as major, and all but one of those were
28 preferred as submerged crossings. One had some question
29 in it but it was analyzed on a preliminary basis and
30 still retained as a submerged crossing.

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 Q Do you remember the name
2 of that crossing, or the name of the river?

3 A I think it was Deep Creek,
4 but I'm not sure.

5 Q Well that all fits in,
6 doesn't it?

7 A Yes. It is well named.

8 Q Well now, I take it that
9 the panel can envisage situations in which there are
10 environmental issues that would lead to consideration
11 of overhead crossings?

WITNESS MIROSH:

12 A Well they would be the
13 same ones that I mentioned from an engineering sense,
14 in terms of the amount of earth movement at the banks,
15 the stability of the banks after construction, erosion
16 control, these factors.

17 Q And the problems of fish
18 and fish areas and so on?

19 A Well we understand that
20 the problems, if there are any, would be of a very
21 minor nature and for a very short duration, just during
22 the installation phase.

23 Q Well have your environ-
24 mental people approved what I take it to be the decision
25 at the moment, to have no overhead crossings on this
26 route?

27 A Well they have not pointed
28 out to us that we should be going overhead for environ-
29 mental reasons in any locations.

30 Q Have they been shown every

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 crossing that you propose to make, and have they been
2 told that you propose to go underground at every one
3 of them at the moment?

4 A Yes, in fact they have
5 been in the field carrying out fish studies at all pro-
6 posed locations, and assisting us to adjust crossing
7 locations if they felt it was necessary.

8 Q Because -- I'm sorry, go
9 ahead.

10 A All based on the premise
11 of underwater crossings.

12 Q Because as I understand
13 it their field work is presently underway, would it be
14 fair to say that they have not yet been formally heard
15 from on the subject of river crossings at specific
16 locations?

17 A Yes, formally in the sense
18 of a report that's true, but we do have our people in
19 the field with them, and are in continual contact with
20 them, so we have feedback in a continuous sense.

21 Q Now simply one other
22 question on river crossings and twinning, which has been
23 fairly extensively canvassed, does FOothills feel that
24 it has the engineering capacity or know-how to repair
25 a breach in the pipe in any seasonal condition that may
26 exist in the Mackenzie Valley?

27 A Yes, we have been studying
28 this and there are techniques which can be used during
29 any season which we would propose in the event of a
30 break.

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 Q And is that true of break-
2 up as well?

3 A For the smaller spans,
4 this would certainly be true where we might if we had
5 such a case --

6 Q Well I am talking about
7 the major river crossings where Arctic Gas has twinned
8 and you have not. Are you confident, are you assuring
9 the Commission that you have the capacity and the know-
10 how to repair in any given seasonal condition?

11 A Well that's a subject
12 which may better be dealt with in the operations and
13 maintenance panel, but our approach has been to design
14 in such a way appropriately to eliminate or minimize
15 to a negligible extent, such an eventuality.

16 Q Well then you don't need
17 an operation and maintenance panel.

18 A Well we certainly have
19 other equipment to maintain at the point of operations.

20 Q Well is it your position,
21 because when Arctic Gas gave evidence, and I think I
22 summarize it correctly, one of the principal advantages
23 of twinning, if I understood their evidence, was that
24 they were not confident that in engineering terms or in
25 terms of environmental impact, they could go into cer-
26 tain rivers at certain times of the year to do repair
27 work. I think I have stated the thrust of their evi-
28 dence correctly. Do you have a different view than they
29 do on that subject?

30 A Well we have a different

Mirosh, Bauer, Walker, Glockner
Cross-exam. by Mr. Scott

1 view to the extent that we feel we can design adequately
2 a single river crossing, as opposed to putting in two.
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1 Q May I simply take you away
2 from the question of whether the river crossing is going
3 to breach or not. 'Do you agree with what I understood to
4 be Arctic Gas's evidence that if at a major river, a
5 crossing breaches, at certain times of the year, it will
6 be difficult, if not impossible, to repair it at that
7 time -- at a given time of year without engineering risks
8 or environmental risks?

9 A No, it would depend on what
10 happened at that particular crossing. If it was a
11 bank failure, this could likely be handled. If there
12 was a metallurgical rupture, for some reason within the
13 pipe beneath the bed. it may be possible to thread through
14 a smaller pipe through the larger pipe which crosses the
15 river. These are some of the possible approaches.
16 There are others that we are looking at.

17 Q Well let me simply ask you
18 again. Are you confident that in all seasons, a repair
19 can be achieved quickly, with due regard for engineering
20 requirements and environmental protection because this
21 may be an important difference between the posture of the
22 two applicants?

23 A Well as confident as we
24 can be with our present knowledge. yes.

25 Q Specifically let's take the
26 underground crossing of the Liard on the way to Yellowknife.
27 A very active river, as I understand it. Are you confi-
28 dent that a repair can be achieved there at any season
29 of the year without doing engineering or environmental --
30 without exposing yourself to engineering or environmental

Mirosh, Bauer,
Walker, Glockner
Cross-Exam by Scott

1 risks?

2 I'm sorry, it's on the way to
3 Simpson.

4 A Yes, do we cross the
5 Liard there, did you say?

6 Q Your feeder line.

7 A I believe that crosses
8 the Mackenzie.

9 WITNESS BAUER.

10 A That is the Mackenzie.

11 Q All right, let's take that
12 then. We can hardly be blamed if we don't know
13 precisely where your feeder lines go.

14 But no doubt you'll tell us in due course.

15 WITNESS MIROSH:

16 A Could you repeat the
17 question please?

18 Q Are you satisfied that
19 that crossing that you can make a repair to a breach
20 in the buried pipe underwater at any season of the year,
21 without any engineering risks, and without any environ-
22 mental risks?

23 A I think I'd have to say
24 that that's one that we haven't spent any time on at
25 this point. But certainly during both seasons of the
26 year, we feel that a temporary repair could be made
27 if not a permanent one, perhaps your example of breakup
28 is one which we'll have to give some thought to.

29 Q Have you discussed the
30 question of repair of breaches of underwater crossings

1 with your environmental people?

2 A No, we haven't.

3 MR. SCOTT: Those are all the
4 questions I have, thank you. Mr. Commissioner.

5 THE COMMISSIONER: Re-examination?
6 RE-DIRECT EXAMINATION BY MR. GIBBS:

7 Q Mr. Walker, there seems to
8 be some misunderstanding about the conforming of the pipe
9 to the ditch and I understand you're prepared to clarify
10 this process and speak to normal practice. Would you do
11 so?

12 WITNESS WALKER:

13 A Yes. First. I believe Mr.
14 Scott indicated that a substantial difference in bending
15 and ditching techniques in a conventional winter, or
16 Arctic construction, between Foothills and C.A.G.P.L.

17 I would like to refer him to page 40 of the construction
18 plans. 60 Construction Procedures, 12 the C.A.G.P.L.
19 application which refers to conventional winter
20 construction procedures and quoting from a paragraph
21 therein, "ditching will normally follow after the bending
22 building and coating operations." The technique on
23 conventional winter construction, that was for conven-
24 tional winter construction, or Arctic construction,
25 goes on and says "there is no basic difference between
26 the ditching procedures in Arctic construction areas and
27 those in conventional winter construction areas."

28 Fundamentally the ditching
29 approach, I believe and the bending sequences for
30 Foothills and C.A.G.P.L. are similar if not close to

1 identical. But one other point perhaps would be
2 helpful, I believe Mr Scott has envisioned a very
3 rigid pipe and having the bending proceeding ahead of
4 the ditching, has suggested that this would cause an
5 extreme problem of matching the ditch line and gathering
6 information from the open ditch, to finalize any
7 changes in the ditch as being a most difficult
8 situation. The pipeline itself is flexible, sufficiently
9 flexible over a distance to allow variations and
10 natural roll of the pipe when placed in the ditch, so
11 that adjustments either for additional depth or for
12 shallower depth requirement can be tapered or feathered
13 back on installation of the pipe without necessary
14 rebending of pipe already welded for installation.

15 Q Thank you. Dr. Glockner,
16 the assumptions implicit in your slides seem to, in
17 this cross-examination, process, assume the status of
18 rigid rules within which Foothills has to operate can you
19 explain again the use and perspective of the curves and
20 diagrams you used, and while doing so, having reference
21 to the 2.7 inches, would you apply the Marshall example
22 to the Canadian Arctic Gas pipe?

23 WITNESS GLOCKNER:

24 A Somehow during our
25 discussion last night, Mr. Commissioner and this
26 morning, we might have gotten the impression that some
27 people had -- the example that I showed last night
28 were indeed the only and rigid design criteria and
29 assumptions for low configurations that Foothills pro-
30 poses to use in the design of the proposed pipeline.

1 As I tried to say last night and this morning, what
2 we showed on the slides were examples. Now there are
3 a complete spectrum of design criteria and load con-
4 figurations which one encounters in such a complex
5 project as this. The examples that were shown on the
6 slides were based on one portion of the spectrum of
7 design criteria and one small part of assumed load
8 configuration.

9 On the basis of these
10 assumptions and load configurations and design criteria,
11 which I don't want to repeat sir, we arrived at. from
12 one of the graphs, at the suggestion of Mr. Marshall.
13 at the numbers 11.3 times 10 to the minus four times
14 200 times 12, last night, which was 2.71 inches, or
15 2 and three quarter inches if you like. Now I said
16 last night or this morning that if you did not choose
17 200 feet as your length. in this calculation, but
18 1200 feet, then you would have of course, an allowable
19 displacement over that 1200 foot length of pipe six
20 times as much displacement which would be about 16.3
21 inches.

1 Since we were also comparing
2 our pipeline this morning with that of CAGPL, I thought
3 it might be worthwhile to just run a very quick on the
4 back of the envelope type calculation before the session
5 started here, and just taking the difference in diameter
6 into consideration, sir, if you use the pipe that is
7 proposed by CAGPL under the same set of design criteria
8 and load configurations, then the allowable maximum
9 displacement of that pipe would be about 1.6 inches, so
10 because it's a much stiffer pipe, a much more rigid pipe.

11 What I am trying to say, sir,
12 is that the examples that we showed here does not indi-
13 cate the total spectrum of design criteria and assump-
14 tions that will be used and are being used in the analysis
15 of the Foothills' pipeline design.

16 If you get to situations where
17 larger displacements are forecast by the geothermal
18 people, then other design criteria and other assumptions
19 are used and have to be used, in order to determine the
20 safety of the pipeline.

21 MR. GIBBS: That completes the
22 evidence, sir, if this panel might be excused and we
23 could go on then to panel 6.

24 MR. MARSHALL: Perhaps if
25 before they are excused, I could ask a question. It
26 seems to me that perhaps Mr. Gibbs has gone beyond the
27 theory of rebuttal evidence a bit, or a re-examination.
28 I didn't interrupt him, I let him go on, but I think
29 arising out of his last series of questions to Dr.
30 Glockner, I would like to put a couple of questions to

Mirosh, Bauer, Walker, Glockner
Cr. Exam. by Mr. Marshall (Cont'd)

1 MR. GIBBS: I don't recall
2 doing it, but I do point out that I was following
3 exactly on the example that he used to demonstrate a
4 point, and we just applied it to his own system.

5 THE COMMISSIONER: Well ask
6 your question, go ahead.

7
8 CROSS-EXAMINATION BY MR. MARSHALL, CONTINUED:
9

10 Q Dr. Glockner, the example
11 that we were working with last night, assumed a limiting
12 factor of 20 percent of the specified minimum yield
13 strength of the pipe, is that correct?

14 A That's correct.

15 Q Now as Mr. Mirosh said,
16 that really is unnecessarily or perhaps unreasonably
17 strict for pipeline design. It's interesting from the
18 point of view of illustrating the process you go through
19 but a 20 percent factor, 20 percent of specified
20 minimum yield strength, is much stricter than is re-
21 quired for safe pipeline operation.

22 A Well let me try to answer
23 this point if I can completely. The 20 percent of the
24 yield moment assumption, or the criteria that was used
25 here, was convenient from several viewpoints. Our
26 material specifies a maximum strain at yield of half a
27 percent, so we assumed in this analysis the maximum
28 strain and the maximum stress of the outer fibres be
29 just that, so that it meant that in these examples here,
30 we would have a completely linear analysis as far as

1 material behaviour is concerned.

2 Q Right, and you selected
3 it with that in mind.

4 A Now, you are quite correct
5 that in order to predict and ascertain and estimate the
6 safety of the pipeline when it's predicted that it will
7 undergo larger displacements, we would very quickly
8 relinquish this design criteria and permit plastic
9 deformations, that is stresses and strains up to the
10 yield and beyond that yield, because we are not dealing
11 with a structural steel material which has a flat yield
12 curve, but a floating strain hardening yield curve,
13 we would relinquish this criteria and take into account
14 such deformations which would permit larger displace-
15 ments.

16 Q Well to see if I under-
17 stand that, using a factor of 20 percent of the speci-
18 fied minimum yield strength of the pipe, the pipe
19 behaves in an elastic manner, that is you subject it to
20 that force and it will, on removal of the force, return
21 to its original state?

22 A Correct.

23 Q In fact, it's only 20
24 percent of the way to the point where it ceases to
25 respond in an elastic manner to the application of such
26 a force. As I understand this concept, and correct me
27 if I am wrong, until you get up to 100 percent of the
28 specified minimum yield strength, the pipe will always
29 return to its original position on release of the force?

30 A That's right, but the reason

1 why the 20 percent was chosen, you see, is because there
2 are other stresses present in the pipe --

3 Q I appreciate that.

4 A -- the internal pressure,
5 and the total stress level, including bending as well as
6 internal pressure and temperature effects, approaches
7 something of the order of 95 percent.

8 Q Right.

9 A It will go back to zero
10 deflection, yes.

11 Q Lawyers have a little
12 difficulty with some of these concepts, and one of them
13 that creates difficulty, I think, is yield. When we
14 are using yield in this sense, you simply mean that the
15 pipe will bend and it will stay in a bent state, rather
16 than behaving in an elastic manner, that is returning
17 to the original configuration?

18 A You put it very well,
19 just like an engineer. If the pipe yields, yes, then
20 it means there will be a permanent deformation after
21 removal of the load, yes.

22 Q Now there's nothing wrong
23 with that?

24 A Absolutely nothing, we
25 do it all the time.

26 Q You can't bend a pipe to
27 get it to conform to the ditch bottom or however it is
28 you are planning to do it, you can't bend it without
29 yielding it?

30 A That's correct, and in

Mirosh, Bauer, Walker, Glockner
Cr.-Exam. by Mr. Marshall (Cont'd.)

1 the manufacturing process there are some residual stresses
2 and residual strains which are beyond the yield --

3 Q Exactly.

4 A -- so this is the normal
5 thing.

6 THE COMMISSIONER: Which are
7 beyond what?

8 MR. MARSHALL: Beyond the yield
9 strength.

10 A Beyond the yield strength
11 that is in the manufacturing process, the pipe is
12 stressed beyond the yield strength of the material, this
13 is quite a normal, acceptable thing.

14 Q So we were talking about
15 20 percent of specified minimum yield strength, and you
16 can go up to a hundred percent of specified minimum
17 yield strength and you still don't have a problem, inso-
18 far as a rupture in the pipe?

19 A That's quite correct.

20 Q And when we are talking
21 about yield in this sense, we are not talking about the
22 pipe rupturing?

23 A No, we are not.

24 Q You have got to go far
25 beyond the yield strength of the pipe before you start
26 to get a rupture in the pipe?

27 A Many, many times.

28 Q So when you had a factor
29 of 20 percent of specified minimum yield strength, that
30 was an extremely conservative factor, if you like, when

1 you have regard to the possibility of a rupture? You
2 selected 20 percent just purely for illustrative pur-
3 poses?

4 A The 20 percent was selected
5 on the basis of Code specifications, you see, because
6 the Code says that you can go up to 80 percent of yield
7 for your hoop stress, due to internal pressure, that
8 leaves you 20 percent for the bending. This is sort of
9 roughly the idea.

10 Q Yes, and the pipe will be
11 stressed beyond 100 percent of the specified minimum
12 yield stress, and it will have to be in order to be
13 bent, and there's no problem with that?

14 A When you get larger dis-
15 placements, yes it will be.

16 MR. MARSHALL: Thank you, that's
17 the end of the questions that I have.

18 MR. GIBBS: I thank Mr. Marshall
19 for his re-direct. The panel might be excused now, sir.

20
21 (WITNESSES ASIDE)

22
23 MR. SCOTT: Mr. Commissioner,
24 I feel obliged to point out, I've been told that Mr.
25 Gibbs' feeder line does in fact cross the Liard River.
26 For my part, I pledge to do everything I can to assure
27 that by the time he gets to the National ENergy Board
28 he knows where it is.

29 I'm now more confident than
30 ever that an examination may reveal that it crosses three

1 biological reserves.

2 MR. GIBBS: Well possibly then
3 you will also be aware that our technique of constructing
4 is the same as Canadian Arctic Gas.

5 MR. SCOTT: Well, on that
6 point, I would just like, for the record, to note the
7 sentence at the top of question 11, where the panel
8 says they have altered the conventional procedure.

9 MR. GIBBS: Well that implies--

10
11 THE COMMISSIONER: Well I
12 think it's unfortunate that Mr. Genest is not with us
13 these days, because it means that you are the only one
14 that Mr. Scott has to battle with, Mr. Gibbs, and --

15 Well is this the end of the
16 panel for the time being at any rate?

17 MR. GIBBS: Yes, if Mr. Scott
18 and Mr. Marshall are finished with them, I am, sir.

19 THE COMMISSIONER: Well thank
20 you gentlemen very much, and we certainly appreciate
21 your coming, and I have the feeling we will be seeing
22 some of you again.

23
24 (WITNESSES ASIDE)

25
26 MR. GIBBS: The next panel,
27 sir, is on communications and Mr. Mirosh remains as a
28 member of that panel, and with him will be Mr. Scrimes.

29 E.A.MIROSH Resumed
30 W.R.SCRIMES Sworn

Mirosh, Scrimmes
In Chief

1 DIRECT EXAMINATION BY MR. GIBBS:

2
3 Q Mr. Mirosh, you are still
4 the manager of engineering for Foothills Pipelines?

5 MR. MIROSH: A Yes.

6 Q And you appeared before
7 this inquiry on other panels?

8 A Yes.

9 Q Can you outline in general
10 terms, the major differences in the area of communicat-
11 ions as between the Foothills and the Canadian Arctic
12 Gas approach?

13 A There are several differ-
14 ences, the most significant being that CAGPL, in their
15 most recent thinking, is proposing to lease their
16 communications system from Telesat Canada Limited. This
17 telecommunications system would be based upon the Anik
18 series of satellites. Foothills proposes to utilize
19 the existing facilities of the Canadian National Tele-
20 communication system as modified to suit our purposes
21 for operations and we anticipate utilizing some trans-
22 portable facilities of Telesat Canada Limited during
23 the construction phase. The Telesat Canada transport-
24 able facilities, however, would be leased through CNT
25 who would act as our major communications sub-contractor.

26 A second difference is that
27 the CAGPL pipeline operations centre would be located
28 in Calgary with all communications for operations
29 directed to that centre. Foothills proposes to locate
30 its operational centre in Yellowknife, and all pipeline

Mirosh, Scrim
In Chief

1 communications in the Northwest Territories would be
2 directed towards that centre.

1 A third difference exists with
2 respect to the number of channels which CAGPL and
3 Foothills require.' We estimate that CAGPL will require
4 approximately two or three times the number of channels
5 which Foothills will require. This is largely a result
6 of CAGPL requiring communications for their complete
7 pipeline system within Canada whereas Foothills only
8 requires a communications system for north of the 60th
9 parallel. The existing pipeline communication systems
10 of Westcoast and AGTL would require a very small incre-
11 mental additions to accommodate the pipeline connecting
12 links between the 60th parallel, Fort Nelson and
13 7ama Lake.

14 Q Would you explain why you
15 feel that CNT can provide this service for Foothills?

16 A Our experience with leased
17 common carriers in Alberta has been very good with the
18 specific example of the Alberta Gas Trunk Line system which
19 depends upon the Alberta Government Telephone system for
20 all of its communications. It has been proven to us
21 in this situation that a communications common carrier
22 can perform entirely satisfactorily to meet the needs
23 of an extremely complex network of pipeline such as that
24 operated by Alberta Gas Trunk Line. CNT has currently
25 under construction a 300 voice channel microwave system
26 which at present is in service as far north as Norman
27 Wells and by the summer of 1976, will be in service
28 up to Inuvik. This system will be more than adequate
29 for our needs leaving sufficient capacity for others in
30 the North. Moreover, the system may be expanded in the

1 future to meet the growing requirements of the north.

2 We are aware that CNT has been
3 operating in the north for some years and is quite
4 conversant with design and construction procedures which
5 are specifically related to northern conditions. We
6 feel confident that communication towers and other
7 facilities can be designed and installed by CNT to with-
8 stand the atmospheric conditions which are prevalent in
9 the north.

10 In addition, CNT currently
11 operates maintenance centres in the Northwest Territories
12 at Inuvik, Norman Wells, Fort Simpson, Hay River, and
13 Yellowknife. In these centres trained technicians
14 are available to maintain all radio and associated
15 support equipment. This infrastructure will be utilized
16 and expanded as necessary to support the communications
17 system which the pipeline would require for operations
18 and construction.

19 In summary, we feel that the
20 experience and performance of the CNT in the Northwest
21 Territories is more than adequate to meet our needs.

22 Q Can you explain in
23 general terms how the pipeline will be serviced by
24 this CNT communications system up to Inuvik?

25 A The pipeline system will
26 have seventeen compressor stations and four meter
27 stations which will require communications with the
28 three district offices and the head office. The district
29 offices will be located at Inuvik, Norman Wells and
30 Fort Simpson with the pipeline operational head office

1 at Yellowknife.

2 CNT will supply the spur radio
3 systems which will connect the backbone communications sys-
4 tem up to Inuvik and the various meter stations and
5 compressor stations as well as the district offices.

6 In terms of radio towers, the
7 communications towers at all stations will be located
8 within the station site and these towers will be of a
9 self supporting nature requiring no guys. In addition
10 to the communication towers, one new active radio
11 tower site will be constructed in the Redknife Hills
12 and a four passive radio repeater sites will be built at
13 various locations along the route. These are the only
14 locations where land will be used specifically for
15 providing telecommunication services for the pipeline
16 outside of the station and office sites.

17 Q Once the CNT system is
18 installed, what assurance do you have that reliable
19 communications will be possible should a failure occur
20 somewhere in the system?

21 A In the terrestrial microwave
22 system, a major risk to integrity of the system is damage
23 to a mainline radio repeater tower. Any serious damage
24 to a tower, the antennae mounted on it, or the equipment
25 and building adjacent to it, can cause a system interrup-
26 tion unless alternate methods of bridging the gap were
27 available. To minimize this risk, CNT can provide four
28 alternate routings which are implicitly contained in
29 their present operations for use in such an emergency.

30 I will refer to these routings

1 on the map which is just being brought forward.

2 This map shows the backbone
3 communications system which I referred to running
4 along the Mackenzie as item number one. There is one
5 possible alternate shown in red, which runs from Inuvik
6 to Tuktoyaktuk, Lady Franklin Point and back to Hay
7 River.

8 This is a CNT and DEW line
9 microwave and troposcatter route. There is a second
10 alternate route, connecting Fort Nelson with Whitehorse
11 back up to Arctic Red and into Inuvik. This is a CNT
12 microwave troposcatter route as well.

13 There is a link currently under
14 construction between Fort Nelson and Fort Simpson.
15 There is a CNT and AGT microwave route connecting Peace
16 River, Hay River and Fort Simpson.

17 Damage to the communications
18 equipment at a compressor station site would result in the
19 loss of remote control and supervision of that particular
20 station until repairs were made. In the meantime, however,
21 due to the inherent design of the station, operations would
22 continue in an unattended and fail-safe mode. Station
23 controls will be designed so that in the event of a loss
24 of communications, the station would continue functioning
25 on its last telemetered commands with protective local
26 controls to maintain station pressures and flows within
27 safe operating limits. In addition, of course, in the event
28 of the loss of communications, these stations may be
29 manned in short order with mobile communications equip-
30 ment if the failure jeopardizes pipeline operations.

1 Q Mr. Scrim. you are a
2 consultant to Foothills Pipe Lines Limited?

3 WITNESS SCRIMES:

4 A Yes.

5 Q Does the sheet attached
6 to the prepared evidence and having your name at the top
7 accurately describe your academic qualifications and
8 experience?

9 A Yes

10 Q Would you read that into
11 the record please?

12 A Education, Bachelor of
13 Science, Electrical Engineering, University of Manitoba,
14 1940. Thirty years experience in the design and
15 development of electrical power, telecommunications and
16 control systems primarily in the crude oil and natural
17 gas industry.

18 1940. Canadian Westinghouse
19 Limited, Hamilton, Engineering Test Course, three
20 months.

21 1940 to 45, Military Service,
22 Royal Canadian Corps of Signals, U.K. Italy and North-
23 west Europe.

24 1945 to 51, Winnipeg Electric
25 Company, Assistant Distribution Engineer.

26 1951 to 1960 Imperial Oil
27 Limited, Western Region Electrical Engineer, specializing
28 in oilfield automation and production control.

29 1960 to 62, Loan assignment to
30 Esso Standard Libya Inc. of Benghazi, Libya, to develop

1 and install a telecommunications system for exploration,
2 production pipeline and terminal operations.

3 1962 to 74, Imperial Oil
4 Limited, producing Department, Western Region,
5 Regional Electrical Engineer and Telecommunications
6 Co-Ordinator. During this period was responsible for the
7 development of a Computer Production Control system for
8 the centralized remote automatic control of crude oil
9 production operations and management information systems.
10 Responsible for the design and construction of the 4.5
11 Megawatt Boundary Lake Gas Turbine driven Power Plant and
12 field distribution system.

13 Responsible for the
14 development of Imperial's telecommunications systems for
15 the Arctic. Was chairman of the Mackenzie Valley Pipe-
16 line Research Limited Telecommunications Committee,
17 past chairman of Canadian Petroleum Association Tele-
18 communications Committee, Alberta and B.C. Technical
19 Committees Chairman.

20 1974 President Scrim
21 Engineering Consultants Ltd. Calgary, specializing in
22 telecommunications and control systems design and
23 applications.

24 Professional Memberships,
25 Registered Professional Engineers, (Alberta)
26 Licensed Consulting Engineer, Alberta, Member of the
27 Institute of Electrical and Electronic Engineers,
28 Senior member Instrument Society of America, Member
29 of the Petroleum Society Canadian Institute of Mining
30 and Metallurgy. Life Member of the Canadian Forces

1 Communications and Electronics Association.

2 Q Mr. Scrim, can you expand
3 upon the use of satellite facilities for Foothills
4 and how does this compare to the approach taken by
5 Canadian Arctic Gas?

6 A Mr. Mirosh has outlined the
7 outlined the communications system proposed for Foot-
8 hills and it is oriented toward a terrestrial microwave
9 system leased from CNT with limited use of satellite
10 microwave services, via Telesat Canada facilities. The
11 satellite services, although provided by Telesat
12 Canada resources, will be leased from CNT and integrated
13 into their terrestrail system. This arrangement is
14 possible due to the fact that CNT is a shareholder
15 in Telesat Canada and shares an RF channel (900 plus
16 voice equivalent circuits) with Canadian Pacific
17 Telecommunications and can thus offer some satellite
18 services.

19 The services considered for
20 Foothills are those consisting of portable earth
21 satellite stations which can be located at strategic
22 locations along the pipeline route for the purpose of
23 providing limited communications(two voice circuits
24 plus one telex circuit) while CNT completes laterals from
25 their existing system to the Foothills sites. These
26 stations can be quickly and easily moved along the right-
27 of-way as circumstances dictate.

1 The voice circuits would ter-
2 minate on the CNT toll switchboard at Hay River and the
3 Telex terminal would operate through the CNT Telex
4 switching centre in Toronto.

5 The principal use of these
6 earth satellite stations will be during the construction
7 phase. However, limited use may be made of them in the
8 operations of the pipeline.

9 Summarizing, the Foothills
10 communications system is designed to operate over a
11 terrestrial microwave system augmented by some satellite
12 microwave services, all leased as a total package from
13 the existing common carrier in the north, CNT.

14 With respect to the CAGPL app-
15 roach to the communications requirements for a northern
16 pipeline, we can refer to testimony presented earlier
17 by CAGPL in which they indicated that their studies
18 narrowed down to three alternate systems:

19 (1) A leased satellite system;
20 (2) A leased terrestrial
21 system, and

22 (3) A company owned and
23 operated microwave system.

24 Of the three choices, it would
25 appear that CAGPL shows a preference for the adoption
26 of a satellite microwave system over the other two
27 alternatives. In fact, a decision appears to have been
28 made in this regard if the article appearing in the June
29 7, 1975 issue of the Financial Post is correct. The
30 item stated that CAGPL had entered into a contract with

1 Telesat Canada to provide a satellite system. However,
2 from the testimony presented to date, no firm commit-
3 ment has been announced at this hearing.

4 In view of the above, one must
5 assume that the CAGPL communications system will be
6 satellite oriented with minimum access to and use of the
7 present established common carrier facilities in the
8 north.

9 In summary, we can say that the
10 communications requirements for Foothills will be sup-
11 plied by means of the expansion of the existing terrest-
12 rial common carrier resources north of the 60th parallel,
13 while CAGPL expect to be supplied by means of a yet-to-
14 be established satellite microwave system duplicating
15 facilities already available.

16 Q Can you comment on the
17 security of a satellite system as compared to that of a
18 ground based microwave system?

19 A The security we shall
20 describe is not related to the internal system relia-
21 bility. The microwave radio specifications, guard
22 bands, alternate spare circuits, et cetera, provide the
23 internal security at comparable levels for both
24 systems. What is of concern is the comparative security
25 of the mechanical plant in each system. Mr. Mirosh has
26 described the terrestrial security that will be avail-
27 able from CNT resources.

28 A satellite system has two
29 major areas to be considered. One, the safety of the
30 "bird" or satellite space station and two, the security

1 of the individual earth satellite stations. The latter
2 are comparable to the terrestrial system terminals that
3 are located at the compressor station sites and any wil-
4 ful damage will result in the loss of communications to
5 and from the particular location. Thus the risks are
6 the same for both systems in this respect.

7 If we now consider the former
8 situation, that of the security of the "bird", certain
9 facts are generally known. Telesat Canada now has
10 three satellites, Anik 1, 11 and 111 presently operating
11 in a geo-stationary orbit, some 11,000 miles from the
12 Equator. Their internal security is provided by the
13 ability to automatically transfer CAGPL service from
14 their R.F. channel on Anik 1 to either of the other two
15 satellite stations. This is comparable to the alter-
16 nates provided by the terrestrial system mentioned
17 previously. However, another consideration can affect
18 the long term security of the satellite stations and
19 that is the life span of Anik 1, 11 and 111. This is
20 estimated to be in the neighbourhood of nine years,
21 which is less than one half of the anticipated life of
22 the proposed pipeline. A future generation satellite
23 is under design to replace the Anik series but is yet
24 unproven, and at this point in time we can only guarant-
25 ee a satellite system up to the life expectancy of the
26 existing satellite stations. In connection with sat-
27 ellite replacement, Telesat Canada is presently depend-
28 ent upon the rocket and launching resources of the United
29 States to place future satellites in orbit. This
30 situation could pose potential future problems in terms

1 of both access and cost.

2 Further, we were recently made
3 aware of the fact, through the news media, that foreign
4 surveillance orbital satellites are monitoring inform-
5 ation relayed to and from earth by means of U.S. and
6 Canadian communications satellites. This may not be of
7 particular concern other than in the event of a major
8 international confrontation when energy resource movement
9 security is essential. Finally, it is rumoured that at
10 least one foreign power has the capability to shoot down
11 both Canadian and U.S. communications satellites by
12 means of I.C.B.M.'s. The loss of the space station
13 would immediately neutralize the complete pipeline
14 communications network without hope of re-establishment
15 by alternative means.

16 In summary, we believe that the
17 security of a terrestrial microwave system is at least
18 equal to or better than that offered by a satellite
19 microwave system.

20 Q Can you comment on how much
21 communications capacity is, or will be, available north
22 of the 60th parallel, and how much of this capacity
23 Foothills will utilize for the pipeline project?

24 A The CNT microwave system
25 north of the 60th parallel, has been designed with an
26 initial capacity of 300 channels. This capacity can be
27 expanded by the installation of additional multiplex
28 equipment should additional channels be required in the
29 future. The proposed Foothills communications system
30 will utilize upwards of 100 channels or approximately

1 one-third of the present CNT system capacity as a maxi-
2 mum foreseeable demand.

3 Q Can you describe in gener-
4 al terms, the communications system and its inter-con-
5 nections as it will exist for the operations and main-
6 tenance phase?

7 A For the operation and main-
8 tenance of a pipeline, the primary function of the
9 communications facilities is to provide a safe, reliable
10 transmitting medium for the information required in the
11 operation of the remote, automatic supervisory control
12 system. It must be designed so that it is capable of
13 transmitting information along the length of the pipe-
14 line for the efficient coordination of the maintenance
15 requirements and also assure rapid response and correct-
16 ion of malfunctions when they occur.

17 In non-technical terms, the
18 proposed Foothills communications system can be broken
19 down into four categories of service; speech, telex,
20 mobile radio and data transmission.

21 The speech requirements consist
22 of a minimum of one private circuit from each compressor
23 station to the district office responsible for that
24 station. There are three district offices located at
25 Inuvik, Norman Wells and Fort Simpson respectively.
26 Each district office is connected to each of the other
27 districts by at least one private circuit, and to the
28 operations headquarters at Yellowknife by at least two
29 circuits. Private circuits are also provided from
30 operations headquarters to the Foothills executive offices

Mirosh, Scrim
In Chief

1 in Calgary, a minimum of three, and one circuit to
2 Alberta Gas Trunk Line's gas control centre in Calgary.
3 In addition, each district and the operations head-
4 quarters will be connected to the respective CNT public
5 switchboards to provide public toll service.

6 The telex facility connects the
7 district offices, the operations headquarters and the
8 Calgary headquarters. It provides a fast, reliable
9 medium for logistics co-ordination.

10 The mobile radio system is
11 required for the coordination and supervision of the
12 pipeline maintenance function. Each district office
13 will be provided with a mobile radio console which allows
14 the district staff to communicate with any vehicle or
15 mobile or compressor station within its jurisdiction,
16 with another district or with the operations headquarters.
17 Each vehicular mobile unit and portable station will be
18 equipped with selective calling facilities, permitting
19 direct communication with any other station in the
20 system.

21 The data transmission service
22 consists of a group of interconnected data circuits
23 capable of data bit rates of up to 2400 bits per second.
24 This bit rate can be transmitted over a standard speech
25 circuit. The function of the data circuit is to trans-
26 mit data to and from the stations, districts, meter
27 stations, to the operational headquarters computer which
28 will remotely operate the pipeline, monitor performance,
29 collect maintenance data and provide centralized station
30 surveillance for the overall protection of the pipeline.

Mirosh, Scrimes
Cr. Exam. by Mr. Carter

1 MR. GIBBS: The panel may now
2 be cross-examined, sir.

3
4 CROSS-EXAMINATION BY MR. CARTER:

5
6 Q Mr. Mirosh, at the begin-
7 ning of your testimony, you outlined three major
8 differences between the Foothills and Arctic Gas pro-
9 posals. I take it that these are the significant
10 differences as far as you are concerned?

11 WITNESS MIROSH:

12 A Yes, to the best of our
13 understanding.

14 Q What I propose to do is
15 ask you some questions following along the order that
16 you set them out in the three differences.

17 The first difference, as I
18 understand it, is that Arctic Gas proposes to lease
19 their communications system from Telesat Canada, whereas
20 Foothills would utilize the existing facilities of CNT,
21 is that correct?

22 A Yes.

23 Q Now, when you outlined
24 this difference, were you intending merely to point out
25 that Arctic Gas' proposal is based upon using a satel-
26 lite system for communication, whereas yours is based
27 on the overland microwave system, or were you in addition
28 suggesting that there was a difference in that Arctic
29 Gas was by-passing CNT as the common carrier in the
30 Northwest Territories?

Mirosh, Scrimes
Cr.Exam. by Mr. Carter

1 A Well the main import of
2 that statement was that there is a difference in total
3 approach, one using a satellite which is a totally
4 parallel system to using the terrestrial microwave
5 system which will exist by the time the pipeline will be
6 functional.

7 Q Were you making the point
8 that as far as you understood it, Arctic Gas would by-
9 pass CNT, and I ask this question because it's my inform-
10 ation that if Arctic Gas used the satellite system,
11 they would lease the Telesat facilities through the
12 existing common carrier, CN in the north and AGT in
13 Alberta, B.C.Tel in B.C. and so on. Is that your
14 information as well?

15 A I believe we understand
16 that Arctic Gas will lease the communications from a
17 common carrier or from a group of common carriers, but
18 the main impact is that it's a totally different
19 approach to communications.

20 Q Yes. Now, Mr. Scrimes,
21 in response to question 11, and I have numbered it at
22 page 7, you discuss the security of these two different
23 types of systems, and compare them firstly with respect
24 to the earth stations and then with respect to, as you
25 call it the "bird." Now, as I understand it, you conclude
26 that the risks are the same for both systems, consider-
27 ing the earth stations and your terminals on the ground?

28 WITNESS SCRIMES:

29 A That's correct.

30 Q And your statement in that

1 respect is at the middle of the page, and if I could
2 refer you to the statement that I am relying on, it
3 reads the latter, 'referring to the earth stations,
4 "...are comparable to the terrestrial system terminals
5 that are located at the compressor station sites and any
6 wilful damage will result in a loss of communications
7 to and from the particular location, thus the risks are
8 the same for both systems in this respect".

9 Now my question is, in your
10 evidence here, you appear to be talking about the
11 terrestrial system terminals that are located only at
12 the compressor station sites, and I wonder if there are
13 not a number of other terrestrial stations, towers,
14 repeater stations in addition to those, that are located
15 at the compressor station sites?

1 A There are additional ones,
2 that is true. The effect is identical in both cases.

3 Q Well are there not a good
4 deal more towers in the land system than there are earth
5 stations in the satellite system?

6 A I question whether there
7 are any more because in the original Anik proposal,
8 if I recall correctly, discussed only the Anik I
9 and Anik II and Anik II providing the alternate means
10 of providing an R channel, radio frequency channel, in
11 the case of loss of service from Anik I. Now, since
12 the successful launching and in service of Anik III,
13 they are offering another choice, which requires, because
14 of the difference in frequency, of the two satellites,
15 of the I and II as opposed to three, they're going to
16 have to have duplicate stations, in every location. to
17 take care of this as a security measure. So you're
18 really getting -- you can have, we have the equivalent
19 of one basic repeater station on the back bone for
20 every compressor station which again gives us two towers
21 in some distance apart, in virtually every location.

22 Q Well. if that's the case,
23 would the earth stations and you say there's two required
24 because of the different frequency, would they not be
25 located at the same site?

26 A They would be located
27 adjacent to one another, that is correct.

28 Q And when I asked you about
29 the number of ground stations, I take it that although
30 there may be the same number, they would have to be at

1 roughly twice the number of locations due to the fact
2 that you've got to have a repeater station roughly between
3 each compressor?

4 A We haven't a repeater
5 station between each.

6 We have a short hop from each
7 of the existing sites, repeater stations to our com-
8 pressor stations. The average hop for the CNT system
9 averages over 50 miles, per site, per hop, which com-
10 pares favourably with our compressor station sites.
11 Now it was mentioned in Mr. Mirosh's evidence that there
12 were three passive reflectors and one active station.
13 The active station that is going in is because the
14 pipeline comes south and the communication system goes
15 southeast to Hay River and to Yellowknife and where the
16 pipeline comes south, from southeast of Fort Simpson,
17 they have to build another one of their standard
18 systems at Redknife Hill. That one station is going
19 to handle our two southern most compressors.

20 And then there are three passive reflectors and
21 a reflector is just an electronic mirror, there
22 is no electronic equipment, it's just a big board up
23 in the -- that reflects the radio waves. There are three
24 of those to get around topographical features which do
25 not permit a line of sight from station to compressor
26 site.

27 Q All right, just so I'm
28 clear on this point. In the Arctic Gas system, they
29 would have the earth stations and these would be
30 located at the compressor stations, and you're telling

1 me that they would have to have two at each site to take
2 advantage of Anik III?

3 A That is correct. I'm not
4 positive that they have it at every site, but certainly
5 this was indicated in the proposal that --

6 Q All right, in the land
7 system, you've got the existing towers, and you'd have
8 another facility at the compressor station site?

9 A Yes, we'll have a self
10 supporting towers that were mentioned, there will be
11 one at each compressor station site.

12 Q So that you will have more
13 sites where you've got a facility subject to outages
14 from storms or whatever than Arctic Gas would. Maybe
15 not more facilities, Arctic Gas would have two earth
16 stations at a compressor station site, but there will
17 be more sites on the map that could be --

18 A I'm not positive about that.
19 I do believe it could be very comparable, because one
20 of the things that is not incorporated in the Telesat
21 proposal is the mobile radio system. The mobile radio
22 system is going to have, of necessity be VHF -- the
23 high frequency radio system and it is going to require
24 line of sight towers or antenna structures to provide
25 them with the mobile radio system which ours has been
26 incorporated because of the existance of CNT towers.
27 Our mobile radio repeaters would be located, our
28 antennæ would be located on the same towers that our --
29 that the backbone system and the branches, the laterals
30 to our compressor station sites are located. So, as I

1 understand it, and as I believe, is necessary they are
2 going to have to -- I'm not saying the structure is
3 anything like the size that we may have but they're
4 certainly going to have some structures and they're going
5 to have to find again, high ground locations to provide
6 line of sight, to provide the mobile radio system up
7 and down their system, their pipeline.

8 Q But this is for the mobile
9 radio not for the communications system on which
10 the whole operation of the pipeline depends?

11 A Just remember that
12 probably the most important aspect to the operational
13 phase is the effective operation of the mobile
14 radio system, because this is the only way in which
15 you're going to get people to respond to upset conditions
16 along your pipeline, be it in the compressor station
17 site or be it a damaged portion of the line.

18 Q All right, but you're
19 talking about a communication service that would have
20 to come in after there's some problem in the pipeline?

21 A Yes -- no, not
22 necessarily. This is something that is going to be a
23 continuing thing, just for the normal surveillance and
24 the maintenance of the system.

25 Q Now, again dealing with
26 the basic difference between the two types of systems,
27 am I correct in stating that if you lose a mainline
28 repeater station, then you have to go to one of the
29 alternate systems that are outlined on the map?

30 A We may not have to. It

1 will be totally dependent on the conditions in the
2 pipeline itself at the time that that occurs. All the
3 compressor stations will be of a fail-safe nature.
4 if we lose one station, we can work both ends to the
5 middle. We can't correspond, we can't communicate
6 across the gap but we can come to every compressor
7 station on either side of this and provided there is
8 not upset conditions, we have some considerable time
9 to get that station back in service. This is omitting
10 the chance of a complete tower being destroyed.

11 Q All right, let's assume
12 that you lose a station just north of Fort Simpson. would
13 you have communication with the other stations north
14 along the line to the Yellowknife control centre, if
15 you did not go to an alternate system as outlined on
16 that map?

17 A Basically you are correct.
18 We would have to use one of the alternate systems.
19 This is dependent naturally upon what the -- we'd have
20 to totally lose the station. It would have to be a
21 complete outage. We can certainly lose portions of the
22 station,---

23 Q Is it true that there
24 is a difference with the satellite system then in this
25 respect and that if you lose one of the earth stations,
26 you still have communications with all of the other
27 stations?

28 A That is correct.

29 Q Now you then go on to
30 discuss the security of the system in terms of the "bird"

1 and again I would refer you to your evidence, and this
2 is at the bottom of the same page, starting right at
3 the last line. You state, a future generation
4 satellite is underdesign to replace the Anik series,
5 but is yet -- is unyet proven at this point in time,
6 you can only guarantee a satellite system up to the life
7 expectancy of the existing satellite stations. Now,
8 my question is, to continue on with the satellite system
9 throughout the length of the pipeline, throughout the
10 period of time of the pipeline operations, would you
11 have to go to a future generation satellite or could you
12 not simply put up another Anik satellite to replace the
13 one that its life expectancy had -- it's life had
14 finished.

15 A At the rate in which
16 telecommunications technology is advancing, I don't
17 believe that at the end of nine years it's going to be
18 economic to put the type of satellite up that we have
19 at the present time. I'm not saying that you cannot
20 do it. I do know that I believe there's still a number
21 four sitting somewhere. The launch vehicles are now
22 getting in the neighbourhood of ten years old, and some
23 of them are rusting away in Cape Canaveral, and I think
24 theres going to be some significant costs in replacing
25 the launch vehicles because of just straight age.

26 THE COMMISSIONER Q What do we do, I know I
27 must sound awfully -- well, what do we do, rent some
28 of those when we want to launch a satellite. How does
29 that work, do you know?

30 A We pay the cost -- this is

1 a cost to Telesat Canada they pay the cost of the launch
2 to NASA. NASA's responsibility ends when the "bird" is in
3 its original -- it's first orbit and it is the
4 responsibility of Telesat with its equipment to put
5 the bird on its geostationery orbit in the right position
6 over the equator.

7 Q What's the cost of the
8 launch?

9 A I'm guessing, but it
10 was certainly somewhere in the neighbourhood of
11 five or six million dollars. This was a discount
12 price, as I recall correctly. We are dependent upon
13 non-Canadian sources to replace this means of communi-
14 cation. We still only build the electronic package,
15 the communications package, the remainder of it is
16 at the moment, is built outside Canada.

17 Q You're saying that
18 a new generation of launch vehicles, whatever you
19 call them, rockets, in ten years time would have been
20 developed that would take the cost of the launch very
21 far beyond the five or six million that we pay so far
22 is that it?

23 A It's hard to say.
24 Technology in this field is developing at such a state,
25 we don't know what the - really what is going to happen
26 but it looks as if in ten years time, hopefully by
27 1980 they're going to be trying the vehicle that will
28 go up and recover some of this equipment and bring it
29 back down and this is in the development stage and it
30 is really anticipated that by that time, they will be

1 able to take the satellite, communications satellite, and
2 place it in orbit with one of these returnable space
3 vehicles and it will come back and do it again for
4 somebody else so the cost is obviously going to be
5 tremendously less expensive. Now how the technology
6 whether it'll be available at the time we want it, I have
7 high hopes that it would be. But there's no assurance at
8 this point in time.

1 THE COMMISSIONER: You say this
2 is an item that is going to become less expensive?

3 A I would imagine it's going
4 to become less expensive. Everybody wants a communicat-
5 ions satellite, the big problem is the earth is only a
6 certain size, and the circumference at 11,000 miles out
7 is limited, and the frequency requirements are also
8 limited, that you're going to be some problems in the
9 next few years.

10 THE COMMISSIONER: If you don't
11 get the dead satellites back, in other words, if you
12 don't clean up the junk out there, does that actually
13 impair the possibility of making use of additional
14 satellites?

15 A It could, it could affect
16 it certainly. For each country that wants to use one
17 of these, where they want complete coverage 24 hours,
18 and not have an orbiting satellite where every so many
19 hours a day they get it twice a day, this system, each
20 country has only got so much space available that will
21 give it coverage, and one of the original reasons that
22 Anik 1 and you must give the Canadian government credit
23 for going ahead and putting Anik 1 in, up in space,
24 which was originally to be an experimental satellite.
25 It is now a very successful commercial satellite, but
26 they really put that one up to get a parking space for
27 future commercial satellites. We were very fortunate
28 and beat the gun. -

29 THE COMMISSIONER: Well,
30 maybe we will stop for a cup of coffee now then?

1
2 (PROCEEDINGS ADJOURNED)

3
4 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

5
6 MR. GIBBS: Mr. Commissioner,
7 I omitted to ask if the CN communications system route
8 map now might be marked as an exhibit and delivered to
9 Miss Hutchinson when this panel is finished. I think it
10 will be exhibit 245.

11 THE COMMISSIONER: It can be
12 put on the wall for a while.

13
14 (CN COMMUNICATIONS SYSTEM ROUTE MAP MARKED AS
15 EXHIBIT NUMBER 245)

16
17 THE COMMISSIONER: Yes, Mr.
18 Carter?

19
20 CROSS-EXAMINATION BY MR. CARTER, CONTINUED:

21
22 Q Just to complete the line
23 of questioning then about the security of the bird,
24 do you have any reason to expect that Telesat will not
25 be in the business of providing satellite services after
26 the next 10 years?

27 WITNESS SCRIMES:

28 A No, I'm not suggesting
29 that at all. I'm suggesting that at the present time
30 they cannot provide a system, a guarantee of what the

Mirosh, Scrimes
Cr. Exam. by Mr. Carter

1 system is going to be for the next 20 years, they can
2 only provide it for the next 8 to 10.

3 Q When you say cannot, do
4 you mean that they are not able, or they just haven't
5 done so?

6 A I think that the next
7 generation bird is in the state of prototype design at
8 this point and stage -- and at this point in time.
9 Now, I'm not positive about this, and I wouldn't wish
10 that to be a definitive statement.

11 Q All right, because in any
12 case as you stated to the Commissioner, the satellite
13 system has proved so far to be very successful?

14 A It's a successful system
15 and we wouldn't be considering using it, we are using
16 it in the short term, because we know it's going to be
17 there for that period of time, without any question.
18 We have seen it operate, we know that it will operate
19 for that period of time. We are not necessarily con-
20 vinced that we would use that as our main -- we would
21 use that as a main system because it cannot be guaranteed
22 that we are aware of, at this point in time, for the
23 duration and life of the project.

24 Q I see, and I believe you
25 stated this in your direct testimony, that the possi-
26 bility is there that you may use it during your operat-
27 ions period?

28 A We may use some of it,
29 yes, but we are not going to be in the position where
30 we are committed to it as our only source. It will

1 augment the existing terrestrial system that CNT will
2 be providing for us, and CNT themselves, being a share-
3 holder in Telesat; by the time that the pipeline in the
4 next two years in the construction begins, are going to
5 have at least two satellite stations in the north here.
6 So they are accepting the philosophy that it's going to
7 be there, and that it is going to be expanded, so I'm
8 just -- my argument is that nobody can prove to me right
9 now that this system alone will provide a service for
10 the next 20 years.

11 Q And I take it from that
12 that you are not overly concerned about the part of the
13 evidence where you talked about the rumours of these
14 intercontinental ballistic missiles and that sort of
15 thing?

16 A No more concerned than
17 anybody would be about any other thing related to inter-
18 national confrontations that could occur. I'm just
19 -- communications is the first thing that will naturally
20 get knocked out in any sort of conflagration, and
21 certainly energy is going to be one of the key criteria
22 of a successful participation. It's going to be
23 something that somebody is going to look at pretty
24 seriously.

25 THE COMMISSIONER: Would it be
26 impolite to ask who this foreign power is that has the
27 capability to --

28 A I can't recall the name
29 of the country, but it just seems to be across the
30 Bering Strait somewhere in that general direction.

1 MR. SCOTT: I thought it was
2 the United States, bearing in mind Mr. Gibbs' attitude.

3 A I was looking north and
4 not south at this point in time.

5 MR. CARTER:

6 Q Does your information in
7 that respect, just to carry it on a little further,
8 tell you about the range of these missiles? You men-
9 tioned that they, as you understood it, could reach what
10 you understood to be the orbiting distance of a
11 satellite some 11,000 miles above the Equator. Have you
12 got any more information in that respect?

13 A I have a rumour, can I
14 include a rumour in testimony, which presumably was
15 a consideration that came from the U.S. defence forces
16 at the time that Alyeska were exploring the different
17 feasibility of satellite and terrestrial system and its
18 use, and they were warned at that time that the same
19 nameless power had actually fired I.C.B.M.'s at their
20 communications satellites, and missed them on purpose,
21 but if you are a good artilleryman, you will know all
22 you have to do is twist a couple of dials and there
23 you are. So, and this is what their surveillance has
24 indicated.

25 THE COMMISSIONER: What did
26 Alyeska choose to do? Did they decide to use a satel-
27 lite system for their pipeline, or did they decide to
28 use the equivalent of the C.N. system?

29 A They are using a combinat-
30 ion of both. They are also leasing their services from

1 R.C.A. Alascom, who is an off-shoot of the Radio
2 Corporation of America, that has the contract to provide
3 all communications in Alaska, and they have, at the
4 present time, they also have a transponder on Anik 1
5 to supply their communication needs at the present time
6 while they are also building a terrestrial system, so
7 that there's going to be a combination of both as I
8 see it.

9 THE COMMISSIONER: Well let me
10 just ask you if they were concerned about the same
11 matter that concerns you, that is that a foreign power
12 has the capability to shoot down U.S. communications
13 satellites, did they decide then to develop a system
14 that would be independent of communication satellites?

15 A I'm not sure that they
16 were prepared to go to the extent of developing a system
17 totally independent, but their primary system was not
18 to be a satellite system, and that is the last inform-
19 ation that has been available to me up to this point.

20 MR. CARTER:

21 Q Were these orbiting
22 satellites that the unnamed power made attempts to hit,
23 do you recall?

24 A All I know is that the
25 story was they had already zeroed in on Anik 1.

26 Q I see.

27 A And probably all the
28 Intelsat series which is the U.S. equivalent they have.
29 Mind you, they have round the world stationary satel-
30 lites that give them round the world coverage on the

1 communications satellite.

2 Q I'm advised, Mr. Scrimes,
3 that the orbits of the Anik satellites are not 11,000
4 miles above the Equator, but 22,300 miles. Do you have
5 any comment in that respect?

6 A Yes I have, I made a
7 mistake.

8 Q All right.

9 A Correct, just over 22,000
10 is correct. I'm sorry.

11 Q Could I wind this discuss-
12 ion up by asking you if these rumours mention anything
13 about whether or not it would be more practical to knock
14 out the pipeline and merely direct a missile at the
15 pipeline, rather than to try and hit these satellites?

16 A I would suggest the pipe-
17 line is very much easier to repair, and to get a rocket
18 and rent some space at Cape Canaveral and get a new
19 satellite built and get it up in orbit, and I think the
20 pipeline would be shut down for a few days if it
21 had to depend upon that.

22 Q Now, to move on, you
23 stated that the satellite system, as far as you are con-
24 cerned, has proved to be fairly successful. Have you
25 done any studies to determine, or to compare the success
26 of the Anik in, for example, providing television to the
27 various cities and towns and settlements in the North-
28 west Territories, without outages in comparison, for
29 example, to the ground network providing television
30 to settlements in Alberta?

Mirosh, Scrim
Cr. Exam. by Mr. Carter

1 A At the present time, cer-
2 tainly it's a new system, it is working extremely well,
3 the satellite system. It provides good quality picture
4 and it operates on a totally different electronic
5 system or a data transmission system than the present
6 generation of microwave television, microwave transmitted
7 television.

8 Q Would it be fair to say
9 that the percentage of outage time is less on say a
10 yearly basis?

11 A I have nothing to substan-
12 tiate yeah or nay on that question.

13 Q I would suggest, Mr.
14 Scrim, that your summary on page 8 in which you state
15 that the security of a terrestrial microwave system
16 is at least equal to or better than that offered by a
17 satellite microwave system might be switched around so
18 that the statement was that a satellite system is at
19 least equal to or better than a terrestrial one.

20 THE COMMISSIONER: Where is
21 this statement again?

22 MR. CARTER: Page 8 as I have
23 numbered them, sir. This is just before question 12,
24 it would be the last statement in question 11.

25 A I think this is --

26 THE COMMISSIONER: Excuse me,
27 you move that around so that it reads "the security
28 of a satellite system is at least equal to or better
29 than that offered by -- ". All right, go ahead, comment
30 on that, if you wish, sir.

A I must stand with the statement that I made.

Q All right. Mr. Mirosh, in view of the comments of Mr. Scrimmes and yourself about the satellite system, do I take it that the principal reason you have opted for the ground system, as I call it, is not so much reliability or security, but more the avoidance of a duplication of existing facilities, namely in the north, in the Foothills' case, the CN facilities?

WITNESS MIROSH:

A That's certainly a primary reason, yes.

Q And this is, I suppose, Foothills and Trunk Line's philosophy in other cases, the most noteworthy in the provision of the pipeline facilities in Alberta, where they propose to use the existing trunk line facilities expanded where necessary, rather than build a complete new system?

1 A Yes that's our general
2 philosophical approach.

3 Q To avoid duplication
4 wherever possible?

5 A Yes, to avoid duplication
6 and to obtain the cost advantages which spill out of that.

7 THE COMMISSIONER: To deliver cheaper gas?

8 A Ultimately. yes.

9 MR. CARTER: Now, with that as a back-
10 ground, I'd like to move on to the second difference
11 that you've pointed out between the two systems and that
12 is that Arctic Gas' communications centre would be in
13 Calgary, whereas Foothills would be in Yellowknife.
14 Looking at the Maple Leaf project as a whole, at least
15 Foothills and Trunk Line's in Alberta, would you not
16 end up with two control centres in your case. one in
17 Calgary and one in Yellowknife?

18 A Yes, in effect perhaps more
19 than that because Trans Canada would be involved to the
20 extent that they would carry the incremental gas and
21 Westcoast would also be involved.

22 Q Trans Canada would be
23 involved in the Arctic Gas project as well.

24 A I see.

25 Q Well, is that your under-
26 standing?

27 A Well I know they're a member
28 of the study group, yes.

29 Q What I'm driving at, is
30 the difference that you've pointed out, that in the system

1 in the Northwest Territories and Alberta, in your
2 proposal you have two control centres. In the Arctic
3 Gas proposal they only have the one in Calgary. I
4 wondered why that was in view of your philosophy of
5 avoiding duplication?

6 A Well the control centre
7 in Calgary for Alberta Gas Trunk Line has a rather large
8 job to do at the present time. We of necessity, to
9 relieve pressure on their work, have developed a control
10 centre in Yellowknife not only because of that
11 necessity but of course, because we'll have major
12 facilities in Yellowknife.

13 Q The major facilities
14 being?

15 A Well it will be the
16 headquarters for the pipeline and it will be the channel
17 for communications to the district headquarters which
18 will be located along the pipeline so that in effect,
19 the logistics and maintenance information, operations and
20 maintenance, will be more or less centralized at that
21 location.

22 Q Yes, I think it's that
23 whole concept that I'm questioning you about and that is
24 why, have you got another centre in Yellowknife,
25 communications centre, and a control centre, and I
26 wondered whether you had found it impractical to merely
27 expand the Calgary centre?

28 A Well the Foothills Pipeline
29 Company is a separate company from Alberta Gas Trunk Line
30 and of necessity would require its own communications

1 and control centre.

2 Q I see, the Foothills
3 system as you've explained it and as it's contained
4 in the application, terminates north of the 60th
5 parallel.

6 A Yes it does.

7 Q And you would have its
8 control centre in Yellowknife and similarly Trunk Line
9 is contained solely within the Province of Alberta and
10 you would have its control centre in Calgary?

11 A That's correct.

12 Q So that when I asked the
13 question of why Yellowknife at least, part of the
14 reason behind it seems to be maintaining Alberta Gas
15 Trunk Line solely within the Province of Alberta.

16 A It's more maintaining
17 Foothills within the Northwest Territories.

18 Q I see, all right. The
19 Executive offices of Foothills are in Calgary as I take
20 it from the direct evidence?

21 A Yes.

22 Q Now, can you tell me why
23 you chose Yellowknife and perhaps I'll preface that by
24 saying it appears that it's a considerable distance off
25 of the mainline and therefore, it raises in my mind the
26 question of why you chose Yellowknife rather than Fort
27 Simpson or some other centre which is closer to the
28 mainline?

29 A Yes, well Yellowknife is
30 of course a large centre compared to the other centres.

1 It has good communications and air routes. It's a place
2 where obviously we can attract people to live in and
3 to work at. It's functionally an area of governmental
4 headquarters for the Northwest Territories, and I
5 think those are some of the thoughts that went into that.

6 Q I see. If it were not at
7 Yellowknife, but at one of the centres along the mainline.
8 do I take it that there would be communication facilities
9 between the mainline and Yellowknife, and at Yellowknife
10 that would not be necessary to construct?

11 A Did you say if it was not
12 at Yellowknife?

13 Q Yes.

14 A And then could you lead
15 me through the rest of that?

16 Q All right. Well, let me
17 rephrase it. With your control centre at Yellowknife
18 I take it that you're going to have to have a communi-
19 cations facility between the mainline and Yellowknife.

20 A Yes.

21 Q That you wouldn't have to
22 have otherwise?

23 A Yes.

24 Q If I can move on now from
25 that second difference between the two proposals that
26 you've set forth to the third. You say that Arctic Gas
27 will require two to three times the number of channels
28 which Foothills will require. I believe this is in
29 Mr. Scrim's evidence, at page two -- page eight of
30 all of the evidence together. including Mr. Mirosh's

1 at the first and it's in response to question 12.
2 Right at the bottom of the page, you state that the
3 proposed Foothills Communication system will utilize
4 upwards of 100 channels or approximately one third of
5 the present CNT system capacity as a maximum foreseeable
6 demand, is that correct?

7 WITNESS SCRIMES:

8 A That's correct.

9 Q Now, could I refer you to
10 Foothills application page 3A-24, part three, Facilities.
11 Starting on the previous page, the text deals with the
12 decision to go for a leased system and I refer you to
13 Number C, on page 3A-24 Capacity. And I quote,

14 "It is anticipated that the
15 pipeline channel requirements will not exceed one
16 super group (60 channels on the CNT mainline) to
17 duplicate their system for such a low relative capacity
18 does not appear logical."

19 I wondered has there been a
20 change in what Foothills saw as being necessary for the
21 number of channels required?

22 A I'm convinced, in my own
23 mind that the initial statement in the application is
24 appropriate, but this was in the earliest stages of
25 looking at our system, or our proposed system. What
26 I am saying now is that that could exceed the 60 to a
27 maximum of 100, and I'm leaving myself and we're leaving
28 ourselves / ^{that} flexibility that if there is a question of
29 overloading the system, we're not going to do it.

30 Q I see.

1 A Also with respect to
2 CAGPL, the minimum requirement -- the minimum channel
3 capacity which can be leased by them is one transponder
4 or 900 plus equivalent channels, and just in a fast
5 count of their requirements, this comes to 300 which is
6 a third -- represents the same percentage of the trans-
7 ponder capacity as our system is going to have on
8 the CNT system. So the two in capacity, this does make
9 it a valid statement that there's somewhere between two
10 and three more channels.

11 THE COMMISSIONER: Excuse me,
12 what was your conclusion? What is the valid statement?

13 A The original statement
14 in the application which stated that 60 channels or
15 a super group would be our requirement from the CNT
16 resources. I'm hedging to the extent of in further
17 detailing our requirements since the application went in,
18 we've expanded that to a maximum, could be a maximum of
19 100. But what I am really saying, is I believe we can
20 still operate our system on the initial 60 but we would
21 like to consider that we might have a requirement to
22 go up beyond that, to a maximum of 100.

23 Q I thought you were comparing
24 that requirement to Arctic Gas' requirement?

25 A In the statement in the
26 prepared testimony, I indicated that CAGSL would have
27 two to three more channels -- two to three times the
28 number of channel requirement that Foothills would have.
29 I was pointing out that the transponder, which is the
30 minimum requirement which is 900 channels is the minimum

1 leased number of channels that are available from
2 Telesat, that's the minimum number of channels that you
3 can lease from them is 900 plus or the equivalent of
4 one colour television circuit and their account of their
5 circuit requirements appears that they are going to use
6 somewhere in the neighbourhood of 300 which is the
7 equivalent of -- we're taking a third of CNT's 300
8 resource, in the form of 100, they are taking 300 of a
9 900 capacity which is also a third of Telesat's
10 capacity available to them.

11 Q So you're taking one
12 third of the terrestrial communication system, CNT. of
13 CNT, they're taking one third of -- let me make sure
14 I understand this, one third of Telesat's --

15 A No one third the
16 minimum --

17 Q The minimum --

18 A They have to lease a
19 minimum of 900 channels.

20 Q And that's the equivalent
21 of one television circuit?

22 A Yes, which is one of
23 the 9 transponders that are in any one of those
24 satellites, and the minimum lease arrangement is one
25 transponder, 900 channels and account of Arctic Gas
26 circuit requirements looks as if it is going to take
27 about 300 of that so they are going to really tie up
28 two thirds of the transponder, that they -- hopefully
29 they're going to do something else with those channels

30 Q Yes well now, let me ask

1 you this. This inquiry is about the impact that all of
2 this will have north of 60. on the Yukon and the
3 Northwest Territories. Are you able to tell me to what
4 extent the requirements of Foothills on the one hand,
5 and Arctic Gas on the other, will tie up radio --
6 excuse me, telephone, radio and television circuits
7 here in the north. In other words, will there be
8 -- will these projects yours and the other one, increase
9 the number of telephone circuits, radio and television
10 circuits available here in the north, or will they
11 diminish them, or is there some other in between kind of
12 answer? Do you want to discuss that?

1 A Let us talk about the
2 telephone which is the primary communication medium for
3 most of the public. We believe that having CNT provide
4 our system, a system for us on their existing and ex-
5 panded system, that this is going to contribute to in
6 some cases the upgrading of local equipment in native
7 communities. It is going to provide them, probably with
8 a lower cost of service for their communication require-
9 ments, because of the revenue that a major pipeline is
10 going to represent to CNT in revenue.

11 THE COMMISSIONER: You mean
12 CNT will have one big fat customer that they don't have
13 now?

14 A I believe that this is
15 right. I mean, they haven't got a big fat customer at
16 the present time, and the services --

17 THE COMMISSIONER: I'm sorry,
18 I don't understand how this works. Isn't the government
19 of Canada, or the Territorial Government, wouldn't they
20 qualify, or do they not make use of the telephone system
21 to the same extent as you would?

22 A They are making more use
23 of it all the time, naturally, as any other successful
24 service. I think what we are really looking at is the
25 fact that CNT, unlike some other common carriers in the
26 United States and in Canada, have built a backbone
27 system initially, with a capacity to take care of major
28 customers in the future, which originally they were
29 looking at the Mackenzie Valley Oil Pipeline when the
30 research group were studying it two to three years ago.

1 They recognized that together with the fact that some
2 while back the government indicated a desire to form
3 a corridor, utilities corridor, following basically the
4 Mackenzie Valley route, and they really invested money
5 in advance to provide a communications system that was
6 capable of handling advanced and increased traffic at
7 the earliest possible time.

8 Now, this system had to be
9 built from scratch, this is going to take a long time.
10 It's there, and it's far in excess of the present needs
11 of the north, and we feel that they are still capable
12 of expanding this system, without giving any interrupt-
13 ion of service, and it's probably going to improve the
14 quality of the service in a lot of communities.

15 THE COMMISSIONER: All right.
16 Now, what about television and radio?

17 A Television at the present
18 time is a C.R.T.C. involvement with C.B.C. and the
19 private television companies. The service at the pre-
20 sent time is provided in the north by Telesat, by Anik
21 1 and 11, on transponders that C.B.C. rent, basically
22 CBC is the television medium at the present time in the
23 north.

24 THE COMMISSIONER: So what I'm
25 getting at is, say in the field of television, if
26 C.T.V. sought to develop its broadcasting system in the
27 north, presumably they would, like C.B.C., use Anik.
28 Would they be limited in any way by the renting of the
29 equivalent of one colour television circuit on Anik
30 by Arctic Gas?

THE COMMISSIONER: What I am getting at is, and I am grateful to you for answering so completely on the telephone thing, we wouldn't want a situation to result if you were to build your pipeline where nobody could make a telephone call because Foot-hills tied up all the circuits. The same goes for television and radio. What about radio, you didn't mention that. Is there any problem there?

THE COMMISSIONER: Broadcasting.

A -- broadcast radio. That

1 too is if CBC and C.T.V. relationship and that too would
2 most likely be on satellite, other than the local station.

3 The intention of C.B.C. in
4 particular, and we discussed it at some length at the
5 Northern Communications Conference some years back right
6 here in Yellowknife, was -- this was when Telesat was
7 just a dream and Anik 1 wasn't up at that point in time,
8 but this was one of their plans was to put their ground
9 stations of medium size, receive only radio and tele-
10 vision in areas where they could then build limited dis-
11 tance terrestrial systems to meet the local community's
12 needs in these various areas, and that is the plan that
13 they are presently working on and developing slowly
14 but surely. Maybe not as they need it, but as quickly
15 as they can fulfill the need.

16 So it does not, really we are
17 talking CNT as a means of doing basically business
18 and personal communications, and that the media is
19 -- other than the possibility of wire service for news-
20 papers and the like, they are going to probably, the
21 media will likely be using the satelliteservices.

22 THE COMMISSIONER: Well thank
23 you, Mr. Scrimes. Carry on, Mr. Carter.

24 MR. CARTER:

25 Q Now Mr. Scrimes, I take
26 it what you said is that you are amending what is stated
27 in the application from 60 to -- a limit of 60, from 60
28 to a maximum of 100?

29 A Right.

30 Q And when you state in

1 your evidence, upwards of 100, you really mean a maximum
2 of 100?

3 A A maximum of a hundred.

4 Q Now does that change the
5 statement in the application that says that for 60
6 channels --

7 THE COMMISSIONER: What's the
8 reference, Mr. Carter?

9 MR. CARTER: The same one, sir,
10 3A-24, 60 channels to duplicate the CN system for such
11 a low relative capacity did not appear logical. Does
12 the 100 channels, does that change that?

13 A No, it shouldn't.

14 Q Now dealing with some of
15 the other points that came up, could you tell us which
16 communities would benefit by the extension of the C.N.
17 facilities to serve the pipeline?

18 A I don't think there's any
19 additional communities, because the system is already
20 there. It's up to beyond -- it's up as far as Fort Good
21 Hope now, so it is already serving the communities that
22 can afford the luxury of the service, and I have no feel
23 at this point in time what the cost of service is to
24 those communities at this time, nor have I any feel of
25 what the tariffs may be with a major customer such as
26 a pipeline on their system. I have no feel for that.

27 The service is available at
28 some limited extent. Now, we are going to have a require-
29 ment for increased public switch network, which means
30 larger telephone exchanges in some of these communities.

1 This is just going to make it more available for people
2 to get service. They're not going to put one in just
3 to fit the size of the pipeline requirements, like
4 anybody else there's going to be expansion capability
5 there, and more people may be able to take advantage of
6 it.

7 Q Well the reason I ask is
8 that my information is that only one community would
9 benefit from the extension of C.N. facilities to serve
10 the pipeline, and that is Trout Lake, and this requires
11 an additional radio drop from the backbone system.
12 Could you comment on that?

13 A This could be true. I'm
14 not, I haven't looked at it in any -- at all, I'm not
15 aware of that.

16 Q All right.

17 A But certainly if Trout
18 Lake is not immediately on the system, some laterals
19 similar to the kind of laterals we are going to put in to
20 the compressor stations, would have to be provided to
21 that community.

22 Q Now, just to conclude
23 then, and get back to the statement of Arctic Gas,
24 two to three times the requirement, have you read the
25 evidence of Mr. McMullen which was given earlier on?

26 A Yes, I have.

27 Q I would like to refer to
28 a short passage from that, and it's in Volume 30, and
29 he states --
30

THE COMMISSIONER: That was

Mirosh, Scrimes
Cr. exam. by Mr. Carter

1 your man, wasn't it?

2 MR. CARTER: That's correct,
3 sir. This is at line 9, and I'm quoting:

4 "To turn to something more
5 applicable than the pipeline system, this is -- shows
6 our estimate of the number of voice channels required
7 for the pipeline system during operation. Typically
8 66 coming up from the south to Fort Simpson, typically
9 54 from Fort Simpson to Norman Wells, and typically 42
10 between Norman Wells and Inuvik, and typically 30
11 between Inuvik and Prudhoe Bay", and that's the end of
12 the statement of Mr. McMullen.

13 Q Now, do you understand
14 from that that those figures would not be cumulative,
15 but that the 66, which is his first figure up in the
16 south, would be the most channels required as far as
17 the evidence that he was giving at this time?

18 A No, I think there's a
19 slight erroneous conception there. The 66 circuits,
20 when you talk of channel capacity, you're talking of
21 what is available between each link, whatever the link
22 may be. You've got 66 which they believe is their
23 requirement to get to their gas control centre or their
24 headquarters in Calgary.

25 Now, as you go along the
26 system, portions of that 66 are further duplicated and
27 multiplexed in to get the various sections, so what you
28 are doing, you are counting total channel capacity, not
29 necessarily the channel capacity between each link.

30 Q All right, but when you

Mirosh, Scrimes
Cr. Exam. by Mr. Carter

1 multiplex that doesn't change your number of channels,
2 your multiplex --

3 A Yes, every single multi-
4 plex is a channel.

5 Q Are you talking about
6 a channel in two different senses then?

7 A No, I'm not, I'm talking
8 -- well yes I am. A multiplex channel is what is called
9 a half duplex, which is one half of a voice channel.
10 So that to get a voice channel, you need two multiplex
11 channels to get what we call in the trade, a four wire
12 system. You have got speech going in one direction over
13 two -- the equivalent of two wires, and speech coming
14 back simultaneously in the opposite direction on two
15 wires. So it takes a -- it takes two radio channels to
16 make a speech channel.

17 Q You have talked and used
18 the word channels and used the figures 60 and 100?

19 A Did I use channel in both
20 cases or did I use circuits?

21 Q I believe it was channels.
22 You can check.

23 A In question 12, I did use
24 300, initial capacity of 300 channels.

25 Q And the other reference,
26 I believe is in the application?

27 A Yes.

28 Q That's 38-24, or 3A-24.

29 A 60 channels, right.

30 Well where I referred to in the application, we were

1 talking about a super group of 60 channels?

2 Q Right.

3 A That is 60 four wire,
4 that's a speech equivalent channel, as opposed to a
5 radio channel which is a half duplex, in other words
6 you need two of them for speech, a speech equivalent circuit.

7 Q Well I am not sure I under-
8 stand all that, but would it surprise you that if you
9 and Mr. McMullen were talking about the same type of
10 channels, and he said that for Arctic Gas north of 60,
11 they required 66 and you said for Foothills, north of
12 60 of course, you required from 60 to 100?

13 A I would question what he
14 meant by 66, whether he's talking about 66 circuits
15 which would be speech circuits, or speech equivalent
16 channels or whatever he was talking about, R.F. half
17 duplex multiplex channels.

18 Q We are talking about
19 north of 60 now, Mr. Scrimmes.

20 A Right.

21 Q And is there any reason
22 that you know of, looking at the two systems, why
23 there would be a difference of from two to three times
24 as many channels required?

25 A I think I stated that it
26 was because of the additional distance. I'm consider-
27 ing that the Telesat proposal, and any proposal that
28 CAGSL are making with respect to their communications
29 system, is a total communications system from at least
30 -- well from Prudhoe Bay to 49th in Saskatchewan at some

Mirosh, Scrimes
Cr. Exam. by Mr. Carter

1 point, and even their distances would require additional
2 -- they have got more compressor stations, they have got
3 more facilities, so they are naturally going to have
4 more.

5 Q That was the point that
6 I wanted to make clear

7 A It doesn't necessarily say
8 that they are going to have three times as much commu-
9 nications in -- at any point than Foothills, I don't
10 believe they will.

1 They're going to have some
2 more because of the very nature of their supervisory
3 control system.

4 Because of the method in which
5 they are going to operate their supervisory control over
6 satellite system.

7 Q But is it not more because
8 they've got a longer system?

9 A Well part of it, is that
10 as well.

11 MR. CARTER: I have no further
12 questions.

13 CROSS-EXAMINATION BY MR. BELL:

14 Q Mr. Scrimes. have you had
15 occasion to examine the effects of the construction of
16 the Alyeska oil pipeline on the public telephone
17 system in Alaska?

18 A The only evidence that I
19 had is -- and it came secondhand through somebody who
20 visited part of the construction earlier this spring,
21 or when they were preparing for construction, and the
22 only statement that came from there was nobody was
23 talking to anybody. They hoped that they would have a
24 communications system sometime.

25 Q Well would it surprise you
26 if you were to learn that the public telephone system
27 in Alaska is taxed to a point where it results in
28 severe inconvenience to its users?

29 A I understand this and there
30 has been a reticence for some number of years, in the early

1 stages of the development of the Prudhoe Bay Oil Field
2 certain major companies that were operating there could
3 not get the Alascom people to get with it and start
4 to expand their system and ⁱⁿ consequence they were against
5 even the regulations of Alaska, there was private
6 systems went in just out of dire necessity of talking
7 further south and along to look after their needs just
8 in drilling and development stages, the early stages of
9 Prudhoe. California Standard is one example that built
10 their own microwave system for quite some distance to
11 take care of their needs simply because there were no
12 resources available. Alaska was noted for an abominable
13 telephone system for many, many years before the advent
14 of the finding of oil.

15 Q Well just to follow up
16 on that, could you suggest measures which we might adopt
17 to avoid that kind of a situation here?

18 A I think the -- well to
19 begin with we've got the basis of a system already here.
20 Which was designed to take care of the expansion that
21 would come with the building of a pipeline. which
22 Alascom were not prepared to invest in. Now, whose
23 fault, whether it's the Alaska Government because
24 it's a government agency, a State agency or the reluctance
25 of RCA to engineer a larger system, I don't know and
26 I'm not familiar with it, and I don't wish to pass
27 judgment.

28 Here we have everything going
29 for us, we've got alternate routes, existing, we have
30 a system that by the time we start construction, we're

1 going to have a backbone right along the pipeline.
2 We have, some of those repeater stations, some of the
3 repeater stations 'CNT have are -- will be almost
4 in our compressor station yards. they're that close,
5 some of them. Virtually you couldn't go and build a
6 private system that would come any closer to providing
7 the needs ^{than} / the present public system that is built
8 there. We've got satellite -- the portable earth
9 satellite stations are the answer to the maiden's
10 prayer as far as the early construction stage where it's
11 going to take CNT time to get laterals off their system.
12 There's the civil and mechanical aspects, tower erection,
13 the acquisition of electronic ^{radio} equipment, it's all going
14 to take time. Telestat is in the position right at the
15 moment of being able to provide somewhere in the neigh-
16 bourhood by the end of this year, eight to ten transpor-
17 table earth stations. at a price which we're prepared
18 and have included in our design to make use of, to provide
19 good communication in the early stages when -- of the
20 logistic camp construction and so on. So I think we've
21 got the best of two worlds for a pipeline to provide
22 early communications.

23 THE COMMISSIONER Q Are you talking about
24 Foothills?

25 A Yes.

26 Q Not about Arctic Gas?

27 A I don't wish--

28 MR.BELL: Q Just so I could understand
29 and ask you to put it in layman's terms, an assessment
30 of the impact of construction of a pipeline on the

1 telephone system, here in the north. those of us who
2 live in the north have had experience with the CNT
3 system and when I pick up the phone to dial the operator,
4 or to make a long distance call, one of four things
5 happens. One of which I consider to be satisfactory,
6 which is I get an answer after two or three rings.
7 The other three things that happen are I get a busy signal.
8 or I have to wait several minutes to get an answer, or
9 just nothing happens, no ring, no nothing. I consider
10 those last three to be unsatisfactory. I would say
11 that --

12 THE COMMISSIONER: A busy
13 signal is unsatisfactory too isn't it?

14 MR. BELL: Yes.

15 THE COMMISSIONER: Depending on
16 who you're calling.

17 MR. BELL: Although I haven't
18 made a systematic study of it, it's my impression that
19 I get an unsatisfactory result about three or four out
20 of ten times that I try. Now can you tell me if that
21 proportion would go up or down, during the construction
22 phase of Foothills Pipeline?

23 A In the very initial
24 stages there are going to be some inconveniences, I'm
25 sure of it, I can't guarantee that there will not be.
26 It's not going to take very long we are looking in our
27 construction phase at what circuits we have, our private
28 circuits dedicated to Foothills and will not interphase
29 with the public's use of the other channels which are
30 available and are still there. There may be some in the

1 case of construction camps there are going to be
2 pay phone requirements, demanded by the contractor which
3 will have to be provided and certainly this may initially
4 put some tax on the circuit availability from certain
5 centres. I don't expect this to last for any protracted
6 period of time, simply because the channelizing equipment
7 or the multiplex equipment is sitting there, ready to be
8 used and it's a question of as simple almost as putting
9 a jumper across to get another 20 circuits out of any
10 particular point along the line. This can be handled
11 in a very, very short period of time. You may not get
12 any inconvenience whatsoever other than in some
13 odd isolated locations.

14 Q What would be a short
15 period of time in your estimation?

16 A I'm not really aware of
17 what resources CNT are going to have to make available
18 to build this system. I have their schedule proposed
19 schedule and time table, and I would venture to say
20 that in a month to six weeks of the initial commencement
21 of surveying and starting the movement of material,
22 that after that it's not going to affect you. A lot of
23 it is going to go over mobile radio on separate circuits
24 and not going to get involved in the -- our main
25 communication not going to get involved with the public
26 service. The place you're going to get it maybe is at
27 night, 10:00, 11:00 at night, when Bill wanted to phone
28 his wife somewhere.

29 Q With people making the non
30 business calls, you have the employees and their families,

1 of Foothills plus other people and their families who
2 are attracted here to the north because of the pipeline
3 construction. Would that in your opinion, extend the
4 length of time?

5 A I think by the time those
6 people -- the stage that those people are physically
7 moving in, the resources will be available to handle
8 their -- there may be some delay in the rate at which
9 additional telephone are going into additional communities.
10 This is a question of the manpower resources that are
11 available and strikes and everything else that comes
12 along, but the physical resources will be available to
13 handle this.

14 Q It's just a matter of the
15 telephone system gearing up for this?

16 A That's right. Now I know
17 that telephone exchanges which are manual at the present
18 time and the system can only support manual ones, will
19 be going to electronic automatic switching. You'll get
20 direct distance dialing and all these goodies will be
21 available because of a major customer on the system that
22 is demanding this level of service. So, it's going to
23 be there for everybody.

24 Q Would you say that in your
25 opinion, the situation will not be any different if
26 Arctic Gas were building the pipeline?

27 A Would you repeat that
28 please?

29 A Yes, would the situation be
30 any different if Arctic Gas were building the pipeline?

1 A No, there is going to be
2 a certain time lag in the provisions of a Telestat
3 system. As a matter of fact, I don't know at what
4 rate they can put in some of the Telestat system
5 requirements. They too cannot be without communications
6 of some description in the initial phases. I'm sure what
7 they're going to have to do is go in on a temporary
8 basis at least, for maybe a portion of the construction
9 period, they're going to have to lease services from
10 the same common carrier that we are going to lease our
11 system from.

12 MR. BELL: Thank you, I have
13 no further questions

14 THE COMMISSIONER: Mr. Bayly?

15 CROSS-EXAMINATION BY MR BAYLY:

16 Q Mr. Scrimes I have a
17 couple of questions. One of which relates to your
18 forecast for the number of circuits which you will
19 require which I take it is somewhere between 60 and 100
20 depending on which, either the application or your
21 canned evidence you refer to. Now are we looking there
22 at circuits for operation and maintenance or are we
23 looking at circuits during construction as well?

24 A The highest rate of circuit
25 requirements will be in the construction phase.

26 Q Do you consider that the
27 number of circuits that you forecast to be adequate for
28 the construction phase.

29 A Adequate for the con-
30 struction phase and will likely reduce in the

1 operation phase. We have additional facilities, at the
2 construction phase that we don't have after we've got
3 an operating pipeline. For example, barge sites, dock
4 equipment locations, these are all extra to the pipeline
5 and these resources are only needed during the actual
6 construction phase. After that, they disappear. And
7 the biggest load will be probably on the VHF mobile
8 radio system but all these resources have got to have
9 telephone interconnections, either by radio or by
10 land line or whatever. It's going to look the same,
11 it's going to be a telephone that you can pick up. it
12 may go over VHF radio and then on to the microwave
13 system, it's going on the microwave system at some
14 point in any case. But these resources reduce,
15 the physical equipment reduces simply because there
16 isn't the same requirements as you have during the
17 heavy construction phase.

18 Q. You referred to new
19 equipment having to be used in order to facilitate your
20 communication system even though it would be equipment
21 that would not be supplied by you but by the common
22 carrier.

23 A The common carrier is going
24 to supply all equipment, that is our proposal. He will
25 own all equipment with the exception of mobile radio
26 equipment and we will rent space on his towers and
27 put our antennas and that, they will engineer. furnish,
28 and install our mobile radio system but it will be owned
29 as a private commercial system by Foothills.

30 Q Well given your experience

1 in this field, may I suggest to you that with the intro-
2 duction of new equipment to facilitate an operation like
3 this, somewhere this equipment must be paid for and very
4 often it is accompanied, whether it's to pay for it or
5 not, by a raise in rates to all customers including
6 those for whom the new equipment is purchased, would
7 that be a fair statement?

1 A Not necessarily, because
2 the cost of the equipment is still going to be a capital
3 charge to Foothills.

4 Q Are you suggesting then
5 that Foothills won't just pay a rate, but that they will
6 pay for the capital cost of the equipment?

7 A We will be paying for a
8 portion of the capital increased investment in capital,
9 plus rates based on fundamentally, on annual contract
10 and the existing tariffs for certain facilities.

11 Q But your evidence is that
12 the entire system that you will be using will have to be
13 improved, in order for it to absorb the kind of load
14 that you will put on it, would that be fair?

15 A No, no, that's not a fair
16 statement. The system is capable of taking this on,
17 all the equipment isn't there because there isn't the
18 need at this moment to put it all in. For example,
19 they are building a 300 channel capacity system, but
20 the 300 channels aren't at every one of those repeater
21 stations, only the number of channels that are needed
22 to do their present business are there. The racks
23 and everything are there, and you buy the tone equipment
24 and filters and so on, and electronic bits and pieces,
25 and you keep adding channels as your system builds.
26 . What they don't have to do is go and rebuild each of
27 those repeaters that were -- some build them for the
28 base band width of maybe 30 channels and then have to go
29 and replace all the equipment, and all the multiplexing
30 to increase those channels. They feel that they can

1 handle all this with the 300 channel capacity system,
2 and I agree with them, and all that is required, the time
3 lag to increase channel availability, particularly to
4 handle the outside pipeline -- outside the pipeline
5 communications, is just a question of -- well you don't
6 do it instantaneously, but the equipment has to be
7 available, but it's a simple matter to expand the number
8 of channels in any one of the repeaters, and the drop
9 equipment at the communities or wherever.

10 Q Now how many voice chan-
11 nels do' each one of these represent? Am I correct
12 in assuming that it's 60 channels equals 60 --

13 A Voice channels.

14 Q -- voice channels, in
15 other words, 60 people could talk on 60 lines?

16 A Yes.

17 Q In layman's terms?

18 A Yes, simultaneously.

19 Q All right. Now, if I
20 can refer you to the application at 3A-12, there's a
21 table regarding O & M facilities and land requirements
22 and I'm not so interested in the land, except as it
23 relates to the number of housing lots and therefore I
24 would assume the amount of personnel that would be
25 involved in various centres. Are you able to locate
26 that, sir?

27 A No, which --

28 Q 3A-12.

29 A Right.

30 Q 12 is the page number, I

1 think and 3A is the section.

2 A Right.

3 Q It's near the front of
4 the book, at least in my volume. Under A for location,
5 --

6 A A3 -- A4 --

7 Q It's a table, Table 3A-
8 1.6.

9 A Right, sorry.

10 Q Now, in that table we are
11 referred to four locations, Inuvik, Norman Wells, Fort
12 Simpson and Yellowknife, and we are given a number of
13 housing lots which I assume would have houses which would
14 be supplied with telephones.

15 A Right.

16 Q 55 in Inuvik; 56 in
17 Norman Wells; 91 in Fort Simpson and 56 in Yellowknife.

18 A Right.

19 Q I'm assuming then these
20 would be Foothills personnel and that each one of them,
21 the way people seem to live, would have a telephone at
22 home, and a telephone at the office?

23 A Not necessarily all 55
24 would have telephones at the office.

25 Q All right, let's assume
26 that half of them would, for the purposes of --

27 A I believe in most of those
28 districts we were looking at probably a maximum of 25 .

29 Q 25 office phones?

30 A Yes, a lot of this staff

Mirosh, Scrimes
Cr. Exam. by Mr. Bayly

1 are your maintenance people that have the same -- they
2 would be more on a call-out basis probably, particularly
3 after hours and they would be called at home.

4 Q Okay, even if we take
5 their home telephones, we come up with a total of over
6 120 telephones in those locations --

7 A Right.

8 Q -- and that is in operat-
9 ion and maintenance alone. If we assume now that every
10 camp in the construction phase also has at least one
11 pay telephone for the use of the construction employees,
12 and I would guess that it would really be more phones
13 than that, would it be likely that during construction
14 anyway, there would be far more than a hundred circuits
15 required by Foothills, either in their own work or
16 through phone calls out generated by their being in the
17 area?

18 A I see what you are getting
19 at, but the circuit requirements that we refer to in the
20 application and in the prepared evidence, are those that
21 refer to the operating and the basic construction, the
22 circuits we are providing certain public service
23 facilities which certainly won't necessarily provide
24 everybody with a telephone onto our system, our portion
25 of the system. So you still have got 200 plus channels
26 available from CNT to handle this.

27 Now, you still use a distri-
28 bution system, I mean standard telephone practice,
29 everybody when you phone, doesn't necessarily get a
30 circuit.

Mirosh, Scrim
Cr. Exam. by MR. Bayly

1 Q I realize that.

2 A However, in the automatic
3 system, in the electronic system now, which by the time
4 this line goes in, I'm sure will be available up here,
5 is what is electronic and computer switching, and this
6 provides^a/great level of availability, and the speed
7 with which the computer can find free channels to put
8 your call down, you may wait half a minute, which might
9 seem forever to get a connection, but otherwise if it
10 had been a manual system or an older mechanical system,
11 you would have just got a busy signal and you would have
12 had to dial again.

13 Q All right, so you are
14 convinced then that even with the 300 circuits, 100
15 for Foothills and their own operation at the maximum,
16 plus 200 for related things, and I don't really think
17 of camps but I think of the government personnel that
18 will be required to police any operation, the number
19 of people that come in for private business opportunities
20 in this area, that those 300 will be adequate?

21 A I can only really go on
22 the basis of people that are much more involved in the
23 operation of major telephone companies, to take some
24 credence in their belief that they can handle this.

25 Q My concern, Mr. Scrim,
26 is this, that whenever a system goes in that is over-
27 loaded, that it appears that the person or the customer
28 who suffers, is not the customer who has 60 or 100
29 circuits, but the customer who has one telephone in his
30 house, and can't get it repaired, or can't get his

1 number changed or whatever the problem, because there
2 is so much work for the company to do, generated by
3 its best customer, and would you agree that that is the
4 kind of situation --

5 A It's a situation that
6 could arise.

7 Q And you have said in your
8 evidence, in your cross-examination evidence, that it may
9 arise at least to a certain extent, some of these in-
10 conveniences I think as you put them, may arise during
11 the construction period.

12 A In the early stage of
13 construction period when -- and this is very dependent
14 upon the lead time that the communications contractor,
15 in this case CNT, has available to them, to acquire
16 the necessary equipment, and it's going to be predicated
17 by that, electronic company strikes and things like
18 this could just completely upset a/ ^{system like this} We have got to
19 assume then that we are going to be able to -- that we
20 will get some level of lead time to allow them to
21 amass some level of supplies to be able to immediately
22 take care of these.

23 I think there is going to be
24 a certain period of time lag before the supply, without
25 interruption, starts to flow continuously.

26 Q All right. Now, given
27 that as the kind of situation that people in the Mac-
28 kenzie Valley may have some concern over, what sort of
29 recommendations would you be prepared to make to ensure,
30 for example, that Mr. Blair's telephone system doesn't

Mirosh, Scrimes
Cr. exam. by Mr. Bayly

1 go in at the expense of the telephone system of say,
2 Paulatuk.

3 A If I were an employee of
4 Foothills, I would think that certainly Mr. Blair's
5 telephone was going to get first priority, and I'll
6 fight you in the corner and make excuses why yours
7 isn't in, and that's just the law of business.

8 Q Yes, well I didn't want
9 to fight anybody over this, Mr. Scrimes, but I did want
10 to suggest that this is a real concern of people, that
11 the big customer will make it difficult for the little
12 customer to get what normally would be scheduled to come
13 to him in any event.

14 A Well I don't -- I think
15 that we are taking care of this by considering the fact
16 that we haven't thrown out, by any stretch of the
17 imagination, the utilization in this period of time, of
18 satellite, temporary satellite communications, that if
19 these sort of situations occur somewhere in the line,
20 we will throw a transportable in, and take certain load
21 off that area which will minimize, certainly minimize,
22 it may not completely at any particular point in time
23 eliminate some of these problems, but it will sure
24 minimize it. I think we are intelligent enough to look
25 at this and be prepared to get with it.

26 Q Now, one other area of
27 question, and that is on the security for which you
28 were concerned, you felt that a ground system was more
29 secure than a system that relied on a satellite which
30 could either go out through something man planned or

Mirosh, Scrimis
Cr. Exam. by Mr. Bayly

1 just a systems failure that would knock the satellite
2 out, and yet you have outlined for us the kind of problem
3 that you might have in a system of microwave towers.
4 The problem appears to me to be, and correct me if I am
5 wrong, that if you were to -- that if a tower goes down
6 or goes out, then the difficulty is to communicate in
7 between the two towers on either side of it. In other
8 words, you need the tower in the centre to complete the
9 communication, except as it relates to distances away
10 from where the tower is.

11 A This is fundamentally
12 correct. There are quite a number of exceptions to
13 this. There is the possibility of routing through our
14 own facilities on behalf of CNT to get some limited
15 service through until whatever repairs are necessary
16 could be made.

17 Q All right, and if your
18 nameless power wanted to put out the communication
19 system, he might find it far cheaper to remove every
20 second tower, than to buy himself an intercontinental
21 ballistic missile?

22 A Yes, and I suppose that
23 the size of our Armed Forces in Yellowknife, it is going
24 to be difficult to keep them from doing it.

25 MR. BAYLY: I have no further
26 questions.

27 MR. SCOTT: Mr. Commissioner,
28 I will only be a moment or two, I think.
29
30

1 CROSS-EXAMINATION BY MR. SCOTT:

2
3 Q Mr. Scrimes, let's see if
4 I understand what you're saying. You're saying first of
5 all, that the CNT system has the capacity presently,
6 with certain modifications for which Foothills will pay,
7 to dedicate to you wholly a one hundred voice circuit,
8 is that correct?

9 A That is correct, yes.

10 Q And those will be utilized
11 exclusively by Foothills, at least during the construct-
12 ion phase, up to 100?

13 A Yes, and they will be
14 used -- it won't be a large reduction. We may have a
15 20 percent, 30 percent reduction, we may not have any.
16 The system is concept as much as it's factual at this
17 point in time. We still are in the position of analyz-
18 ing in detail what the final supervisory control system
19 is going to look like.

20 Q All right. Now -- I'm
21 sorry, go ahead.

22 A Well what I am really
23 saying is that these circuits, we are paying toll
24 charge for the equipment on it, we are paying a rental
25 for each of those lines as the equivalent of a private
26 system run by CNT.

1 Q Well let's see if I can
2 ask some short questions and get some short answers.
3 There are going to be 100 wholly dedicated circuits for
4 the inside Foothills telephone system?

5 A Correct.

6 Q And I take it that in
7 addition to those circuits, there will be, CNT will have
8 additional operating costs as it puts 100 circuits
9 available that are not now being utilized.

10 A That's correct.

11 Q They'll need more girls
12 and more equipment and all the rest of it.

13 A They don't need more girls,
14 they need more equipment.

15 Q All right. Almost all of
16 these calls are likely to be what we classify as long
17 distance calls?

18 A Ours are not long distance
19 calls.

20 Q Well, you don't pay more.

21 A We don't pay on a long
22 distance mileage basis, as the public system charges for
23 telephone calls.

24 Q But they utilize the
25 necessity of making transfers because they may be some
26 distance away?

27 A That's correct. The
28 circuit is taken completely from its point of origin
29 to the last switching -- well take it from point of
30 origin, be it at Inuvik to Yellowknife, that circuit

1 complete going through each of the repeaters, all the way
2 along is a dedicated circuit. to Foothills.

3 Q All right. so Foothills
4 will be requiring CNT to make certain capital costs
5 for those 100 circuits and there will be certain maintenance
6 or service costs associated with them?

7 A Correct.

8 Q And I take it that that
9 is all the financial obligation of Foothills?
10 No private subscriber is going to pay for any of that?

11 A No private subscriber will
12 pay for any of that. It is more likely that costed in
13 this is improvement of service to the public.

14 Q Well that's a cheerful
15 note. Now have you done any studies which indicate that
16 100 circuits will be adequate?

17 A Yes.

18 Q What studies have you
19 done?

20 A I'm referring to the
21 proposal that was presented to us from CNT and an
22 examination of that.

23 Q Well who made this
24 proposal?

25 A The engineering department
26 of CNT.

27 Q I see, and is that
28 available?

29 A I wouldn't wish to make
30 it available. However, I'll let our counsel answer that.

1 MR. GIBBS: Clearly there is
2 some suggestion of privilege involved, so perhaps I can
3 discuss this with Mr. Scrimis. I haven't seen it.

4 MR. SCOTT: All right. well
5 subject to any privilege, we can resolve that later.

6 Q Now I think you have
7 agreed with Mr. Bayly that if you take only the
8 construction crews, the homes of Foothills workers, the
9 homes and offices of persons who come here either to supply
10 the pipeline or to regulate it, there are going to be
11 a requirement for a substantial number of voice
12 circuits that are not now being utilized by CNT.

13 A That is correct.

14 Q Yes, and that will
15 involve in the same way a capital cost.

16 A That is correct.

17 Q And that will involve in
18 addition a maintenance and service cost?

19 A Correct.

20 Q Now have you done any
21 studies to determine the volume of, as I call it, of
22 non Foothills 100 circuit calls, that will be generated?

23 A I have not. I believe that
24 CNT in their normal rate structure basis and their
25 prognostication of development have formulae on that
26 which they use that are standard in the telephone and
27 communications business and I'm sure that they use those
28 kind of parameters to determine the size.

29 Q Well maybe CNT then should
30 be on the panel, but what I'm asking you is do you know

1 anything about or does your company know anything about
2 the volume that will be generated apart from the 100
3 circuits in the Northwest Territories as a result of
4 your presence here?

5 A I couldn't answer that at
6 this point in time.

7 Q And if CNT knows, I take
8 it they haven't told you?

9 A Perhaps because I haven't
10 asked them.

11 Q All right. Well now you've
12 told us that that will involve capital costs, we have
13 your assurance that those capital costs will be borne
14 by Foothills and not by the private individual.

15 MR GIBBS: This witness can't
16 give that assurance.

17 MR. SCOTT: All right.

18 MR. GIBBS: Who bears capital
19 costs for what service.

20 MR. SCOTT: Let me ask this
21 question. I take it the arrangement you make with CNT
22 is in the form of a contract?

23 A That would be right.

24 Q Yes.

25 And the contract can cover
26 subject to regulatory approval, if that be necessary,
27 whatever matters the parties proposed that it should
28 cover?

29 A I don't know how familiar
30 you are with the power industry.

1 Q Not very much. There'

2 A There's a similarity here

3 where certain specific services for specific customers
4 certain capital costs are paid for to amortize in lieu
5 of amortizing this cost, in increased rates. Rate
6 structures for the most part are set by utility commission
7 and utility boards and -- who sets the rates for
8 communications, some of through the Department of
9 Communications and the Board of Transport Commissioners
10 et cetera. In any case, what they are saying is that
11 we have to charge -- we're going to charge a certain
12 tariff which is a tariff that has been approved by the
13 government, for certain services. Now, if over and above
14 those services we're going to charge you a cost of
15 service, a non recurring charge to provide the extra
16 capital to provide these services and we're going to
17 take a normal -- we're paying normal lease rates, for
18 private wire or private circuit service. So there's
19 three, and in addition to that, there are certain
20 additional maintenance charges which become an annual --

21 Q I'm not talking about
22 usage charges. what I want to ask Foothills is regulatory
23 approvals aside for the moment, to what extent is
24 Foothills prepared to bear the capital costs and the
25 increased service costs, that is the development of
26 manpower, to man the telephone system. that may be
27 rendered necessary by virtue of the fact that Foothills
28 is building a pipeline in the Northwest Territories
29 and it's employees are using the telephone?

30 MR. GIBBS: I'm sure Foothills

1 cannot provide an answer to that sir, we have not got
2 to the point of negotiating contracts. Again, no matter
3 what the private parties negotiate, the regulatory
4 agency always feels able to impose its will upon
5 contractual relations. It is also a policy matter to
6 be determined by Foothills, senior management and
7 there is just is not an answer to that.

8 MR. SCOTT: Well then this
9 panel can't answer it I take it.

10 MR. GIBBS: No they cannot.

11 MR. SCOTT: Well then I'd be
12 grateful Mr. Gibbs if it can be produced. would allow
13 us to see a copy of the proposal that CNT has made,
14 I take it that no proposals for contracts have been made
15 either by Foothills or by CNT apart from that?

16 MR. GIBBS: Mr. Mirosh could
17 perhaps answer that. You must remember that Mr. Scrimes
18 is a consultant and an advisor.

19 WITNESS MIROSH:

20 A We have not discussed the
21 contract. We have from CNT the elements that would go
22 into a contract which are CNT's assessment of our
23 capital charges and our annual charges.

24 MR. SCOTT:

25 Q Well let me ask a very mun-
26 dane matter. Have you -- before I get to it, is that
27 the proposal that Mr. Scrimes referred to?

28 A Yes, in addition to the
29 cost factors, there are engineering factors in that
30 proposal.

1 Q Well I'd be grateful to
2 see those if there's no privilege problem that my
3 friend and I cannot resolve.

4 MR. GIBBS: Yes, well if there
5 is I'll communicate it.

6 MR. SCOTT.

7 Q Well let me ask you this
8 You're having construction camps of 400 men. How many
9 pay telephones are you going to have there. one?

10 A No, there will be several,
11 I'm not sure of the number, but I believe these are
12 generally a union negotiated requirement. So many pay
13 phones per so many people.

14 Q Have you done any -- perhaps
15 I should ask you Mr. Mirosh. have you done any research
16 into the impact of Alyeska in terms of domestic, that
17 is non Alyeska consumption of voice circuits?

18 A No sir.

19 MR. SCOTT: Those are all the
20 questions I have, thank you sir.

21 MR. GIBBS: Now sir. if this
22 panel could be excused.

23 THE COMMISSIONER: Thank you
24 very much again Mr. Mirosh and Mr. Scrimes. You're
25 excused from this panel and we'll adjourn until 9
26 in the morning then.

27 (WITNESSES ASIDE)

28 (PROCEEDINGS ADJOURNED TO SEPTEMBER 17, 1975 AT 9:00 A.M.)
29
30

347
M835
Vol. 62

AUTHOR

Mackenzie Valley pipelin inquiry:

TITLE

Vol. 62 16 September 1975

BORROWER'S NAME



CA1
Z 1
-74M21

Government
Publications

MACKENZIE VALLEY PIPELINE INQUIRY

IN THE MATTER OF APPLICATIONS BY EACH OF
(a) CANADIAN ARCTIC GAS PIPELINE LIMITED FOR A
RIGHT-OF-WAY THAT MIGHT BE GRANTED ACROSS
CROWN LANDS WITHIN THE YUKON TERRITORY AND
THE NORTHWEST TERRITORIES; and
(b) FOOTHILLS PIPE LINES LTD. FOR A RIGHT-OF-WAY
THAT MIGHT BE GRANTED ACROSS CROWN LANDS
WITHIN THE NORTHWEST TERRITORIES;
FOR THE PURPOSE OF A PROPOSED MACKENZIE VALLEY PIPELINE

and

IN THE MATTER OF THE SOCIAL, ENVIRONMENTAL AND
ECONOMIC IMPACT REGIONALLY OF THE CONSTRUCTION,
OPERATION AND SUBSEQUENT ABANDONMENT OF THE ABOVE
PROPOSED PIPELINES

(Before the Honourable Mr. Justice Berger, Commissioner)

Yellowknife, N.W.T.

September 17th 1975

PROCEEDINGS AT INQUIRY

Volume 63

CANADIAN ARCTIC
GAS STUDY LTD.

SEP 23 1975

LIBRARY

APPEARANCES:

Mr. Ian G. Scott, Q.C.
Mr. Stephen T. Goudge,
Mr. Alick Ryder and
Mr. Ian Roland for Mackenzie Valley
Pipeline Inquiry;

Mr. Jack Marshall,
Mr. Darryl Carter, and
Mr. John Steeves for Canadian Arctic Gas
Pipeline Limited;

Mr. Reginald Gibbs, Q.C.
Mr. Alan Hollingworth for Foothills Pipelines
Ltd.;

Mr. Russell Anthony,
Prof, Alastair Lucas for Canadian Arctic
Resources Committee;

Mr. Glen W. Bell and
Mr. Gerry Sutton for Northwest Territories
Indian Brotherhood and
Metis Association of the
Northwest Territories;

Mr. John Bayly for Inuit Tapirisat of
Canada and the
committee for Original
Peoples Entitlement;

Mr. Ron Veale and
Mr. Allen Lueck for the council for the
Yukon Indians

Mr. Carson H. Templeton for Environment Protect-
ion Board;

Mr. David Reesor for Northwest Territories
Association of Muni-
cipalities

Mr. Murray Sigler for Northwest Territories
Chamber of Commerce

CANADIAN ARCTIC
GAS STUDY LTD.

SEP 23 1975

LIBRARY

INDEX OF WITNESSES

WITNESSES FOR FOOTHILLS PIPE LINES LTD.

PANEL 7 - PHASE 1

E.A. MIROSH

R.M. LAZERTE

P.A. BEER

- In Chief

- Cross Examination by Mr. Marshall

- Cross Examination by Mr. Bayly

- Cross Examination by Mr. Scott

8970

9011

9033

9061

PANEL. 8 - PHASE 1

D.H. HUSHION

J.B. WETTERBERG

E.SHELTON

W.B. HOLTRAUM

- In Chief

Cross Examination by Mr. Marshall

9114

9153

INDEX OF EXHIBITS

1	Number	Description	Page
2	246	Typical Compressor Station Plot plan	8985
3	247	Fig. 1; Simple Gas Turbine	8998
4	248	Fig. 2, Two Shaft Gas Turbine	8999
5	249	Table: Permissible Noise Exposure	9004
6	250	Letter from J. Buchan to the Commissioner dated Sept.15th,1975	9073
7	251	Letter from Mr. Hurd, Canadian Arctic Gas to Mr. Buchanan dated August 1 th, 1975	9073
8	252	Table 1: Steel Ingot and Pipemill Capacities.	
9		Table 2. Foothills Project Line Pipe Requirements	
10		Table 3. Total Project Requirements as a percentage of Pipemill Capacity	9128
11	253	Table 1. Classification of Natural Gas Pipeline Leaks and Ruptures by Cause	
12		Table 2. Number of Ruptures of Natural Gas Pipelines by cause	
13		Table 3. Incidence of Operating Ruptures on the AGTL Natural Gas Pipeline System	9136
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			
30			

INDEX OF WITNESSES

D.H. HUSHION
J.B. WETTERBERG
L. SHELTON
W.B. HOLTBAUM

- Cross Examination by Mr. Marshall cont'd 9163

Yellowknife, N.W.T.

September 17, 1975.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. SCOTT: Mr. Commissioner,
I undertook to my colleagues the other day to announce
the order of proceeding for the next couple of months.

All counsel and the public have
a list of the weeks in which there will be formal hear-
ings between now and the end of that year. That was
circulated at the conclusion of the last session. Our
timetable for the future, within that framework of weeks,
is as follows: It seems possible that we will complete
Mr. Gibbs' evidence perhaps on Monday, or early Tuesday
next week.

Following that, we propose to
recall Mr. Templeton, and Professor Adam of the Environ-
mental Protection Board who gave evidence earlier on
phase 1 matters in order to submit to cross-examination.

Following that, we will ask
Mr. Marshall to call Mr. Dau, who had some tag-end
evidence relating to the construction panel, of which
he has given us notice, and which can I think be dealt
with reasonably quickly.

Thereafter, I understand that
none of the other participants have Phase 1 evidence
that they propose to call, and Commission counsel will
begin to call the evidence that we have, and with any
luck, there is at least a possibility that that can be

1 completed within the week so that will be our order of
2 proceeding for next week.

3 At the following session, we
4 will continue to completion, the evidence relating to
5 alternative corridors that was begun at Whitehorse. That
6 will involve the following matters --

7 MR. MARSHALL: Excuse me, just
8 before you get into that, I thought Mr. Scott, that
9 there would have been some other aspects of Phase 1
10 that wouldn't have been dealt with, or was I wrong? Did
11 not Mr. Anthony have a witness he wanted to call?

12 MR. SCOTT: MR. Anthony has
13 a witness and I understand he's interviewed him. He has
14 not prepared a summary of his evidence, and consequently
15 it would not be possible to call him without the consent
16 of everybody next week.

17 What I would propose to do is
18 to allow him to call that witness first in the following
19 sequence, or alternatively I gather that witness is
20 capable of being treated as a witness in one of the other
21 phases. Much will depend on what Mr. Anthony is able to
22 tell us about his state of readiness, but I think it's
23 clear that he won't be able to call that evidence next
24 week.

25 MR. MARSHALL: Well, MR. Scott,
26 I don't want to interrupt your summation of these things,
27 but I think from the point of view of Arctic Gas, we
28 would like to get that witness' evidence in as he appar-
29 ently is a Phase 1 witness, and we would like to have
30 Phase 1 wrapped up before we move on to wrap up, if you

1 like, the alternative corridors' evidence. So not only
2 would there be Mr. Anthony's evidence that he is calling
3 for CARC but then there would be any rebuttal evidence.

4 MR. SCOTT: Yes.

5 MR. MARSHALL: And would that
6 then precede the wrap-up of the alternative corridors'
7 evidence?

8 MR. SCOTT: That would precede
9 the wrap-up of the alternative corridors' evidence, and
10 I would presume that Mr. Anthony would have to let us
11 know next week at the beginning of next week at the
12 earliest, whether he proposes to call that witness or
13 not. He says he will let us know if he proposes to call
14 that witness, he would then be the first witness to be
15 called in the next session in October, and following that,
16 there will be any reply evidence that either Arctic Gas
17 or Foothills have with respect to Phase 1..

18 Then we will move on to the
19 continuation and completion of the alternative corridor
20 evidence, which will involve the return of a number of
21 witnesses, to be cross-examined or to complete their
22 cross-examination, the leading of any evidence that Mr.
23 Gibbs may have with respect to alternative corridors,
24 and the leading of witnesses for other parties.

25 It is anticipated that that
26 will take between one and two weeks. At the conclusion
27 of that, we will move to Phases 2 and 3, and the order
28 of proceeding in Phases 2 and 3 will be the same as the
29 order of proceedings in Phase 1, and it is anticipated
30 that all the evidence in Phases 2 and 3 may be completed

1 by the end of December.

2 Now in Phases 2 and 3, Mr.
3 Commissioner, we have notice from Mr. Marshall that he
4 intends to call a Phase 2 panel, which will be reasonably
5 large, I think six or seven persons, and a Phase 3 panel
6 of about the same size. With respect to the Phase 2
7 panel and the Phase 3 panel, if the process works
8 effectively, we propose to permit cross-examination of
9 each member of that panel after he has given his evidence
10 and before succeeding members of the panel go on to give
11 theirs. That is possible in Phases 2 and 3 because the
12 subject matters that will be covered by the panels are
13 easily divisible, or relatively easily divisible.

14 Now, with respect to Mr. Gibbs'
15 panel, he has not been able to let us know yet what
16 evidence he will be calling in Phases 2 and 3. His
17 instinct, as we understand it and have observed, is for
18 smaller panels, and if that continues, there will be
19 no problem with proceeding with the normal kind of cross-
20 examination that we have had to date. I suggest that
21 we simply leave that until Mr. Gibbs is in a position to
22 let us know precisely what his evidence will be in those
23 phases.

24 After the two applicants have
25 led evidence, the normal order for other participants'
26 evidence will be followed and as I say, we anticipate
27 that the matter can be completed -- Phases 2 and 3 can
28 be completed by the end of December.

1 We would then intend to move
2 on to a phase which will deal with the producers
3 evidence, respecting developments in the Delta, and
4 if the applicant, Arctic Gas is in a sufficient state
5 of readiness and has filed its studies evidence as to the
6 cross delta route. It is hoped that that will begin
7 in January and I would propose that if it does, we
8 should begin by sitting a number of weeks to hear that
9 evidence at Inuvik.

10 Now beyond that in terms of
11 timetable, I'm not now prepared to go.

12 THE COMMISSIONER: Well,
13 we're ready for this panel then presumably.

14 E.A. MIROSH. Recalled

15 RONALD M. LAZERTE. Recalled

16 PATRICK A. BEER Sworn

17 MR. GIBBS: Mr. Commissioner,
18 this panel will deal with compressor station design,
19 it consists of Mr. Mirosh, Mr. Lazerte and Mr. Bear. I
20 think Mr. Bear is the only one who has not been sworn,,
21 Mr. Mirosh, by now, is known to the inquiry.

22 DIRECT EXAMINATION BY MR. GIBBS.

23 Q Mr. Mirosh, can outline
24 for us the basic differences between the Arctic Gas
25 and Foothills approaches to station design?

26 WITNESS MIROSH:

27 A There are several basic
28 differences in station design between the two companies.
29 In the first instance, CAGPL proposes 15 typical
30 refrigerated stations, to occupy approximately 25

1 acres, excluding a helicopter pad and communications
2 tower. Foothills site requirements are 11 acres at
3 each station, including a helicopter pad and communications
4 tower.

5 In Canada, north of the 60th
6 parallel, the CAGPL application shows 18 compressor
7 stations, while the Foothills application shows 17.
8 Considering both the size of the station sites and the
9 number of stations, lesser land use with resulting
10 lesser borrow requirements, are indicated for the
11 Foothills project.

12 A second difference related
13 to station design is that CAGPL proposed to construct
14 two 6,000 foot air strips and six 2400 foot airstrips
15 at eight compressor stations locations in the Northwest
16 Territories. Foothills does not propose the construction
17 of permanent airstrip facilities in the Northwest
18 Territories, but would instead rely on helicopter
19 transport along the right-of-way and helicopter trans-
20 port supplemented by fixed-wing aircraft operating
21 from lakes or winter airstrips for transport between
22 the working areas, and the existing commercial airports.
23 For operations, Foothills believes that helicopter
24 transport will be adequate and therefore no operational
25 requirements for temporary airstrips is foreseen. The
26 requirements for land use and borrow materials for the
27 eight CAGPL airstrips do not apply in the case of
28 Foothills. Of necessity, the CAGPL airstrips would be
29 connected by permanent roads to the compressor station
30 and this requirement does not exist for Foothills.

1 The third area of difference in
2 station design is the use of refrigeration during early
3 years of pipeline operation. Foot hills proposes to
4 provide refrigeration at some compressor station sites
5 prior to the installation of compression to ensure line
6 stability after construction. CAGPL proposes to install
7 refrigeration when compression is installed at com-
8 pressor station sites.

THE COMMISSIONER:

9 Q Excuse me, Mr. Mirosh,
10 this may have been discussed before, but if it was
11 discussed, I didn't quite follow it. Would you mind
12 explaining that.

13 A You mean the --

14 Q You say that you're going
15 to provide refrigeration at some compressor station
16 sites prior to the installation of compression to
17 ensure line stability after construction. CAGPL proposes
18 to install refrigeration when compression is installed
19 at compression station sites.

20 Well since there's no gas
21 in the pipe, presumably, until after compression is
22 installed, what's the difference. Why is your early
23 refrigeration -- I see, you mean as compression is
24 built up on CAGPL they will only refrigerate then.
25 At any rate, see if you can -- it may be too early in
26 the morning, but see if you can make this clear to me.
27 It's my fault, not yours.

28 A Well, I'll try. Of course,
29 when you compress gas, you create, or you impart heat
30 to it and the ideal thing would be to remove that heat

1 by refrigeration immediately. In the case of Foothills,
2 we only have, I believe, one or two compressors, we're
3 installing in the first year. There would only be one
4 or two locations where gas ^{is} being compressed or
5 picking up heat by compression. But we intend, on
6 installing refrigeration capability not only at those
7 locations, but at intermediate locations, to ensure that
8 the gas temperature will be below ground temperature.
9 In other words, to ensure that we create a frost situation
10 around the pipeline.

11 Q CAGPL is only refrigerating
12 where they are compressing the gas?

13 A Yes.

14 Q Their refrigeration program
15 builds up with compression, is that it?

16 A Yes.

17 I don't recall how many stations
18 they had on their first year of operation, but if they
19 had three or four compressor stations they would
20 install refrigeration at the same three or four.

21 Q I understand, thank you.

22 A Another area of differences
23 in refrigeration is that Foothills proposes to chill
24 the gas below 32 degrees Fahrenheit until the crossing
25 of the Mackenzie River at Fort Simpson. South of
26 Station 14, which is on the south side of the Mackenzie
27 River at Fort Simpson, Foothills proposes to maintain
28 flowing gas temperatures above 32 degrees Fahrenheit.
29 The CAGPL application indicates that flowing gas
30 temperatures will be below 32 degrees Fahrenheit to
about Fort Simpson, and south of that point will

1 fluctuate seasonally both above and below 32 degrees
2 Fahrenheit as far south as Northern Alberta.

3 An additional difference in
4 station design is that Foothills proposes to install
5 sufficient compression for the first year of pipeline
6 operation to deliver 800 million cubic feet per day of
7 gas which Foothills believes will be the Canadian market
8 requirements at that time. CAGPL on the otherhand
9 proposes to install compression capacity for their first
10 year of operation, such that 450 million cubic feet per
11 day of gas over and above that which Foothills considers
12 necessary for Canadian market requirements, will flow
13 during the first year.

1 Q The Foothills' project
2 proposes 17 compressor stations and 4 meter stations to
3 be constructed ultimately. Can you explain in general
4 terms how this system would be operated from its head-
5 quarters in Yellowknife?

6 A Foothills proposes to
7 design the supervisory control system and local automat-
8 ion at the stations, so that all meter and compressor
9 stations will ultimately be unmanned. This will be
10 possible by using the highest quality mechanical and
11 electronic components at the stations, together with
12 implementing the latest in proven technology employed on
13 other pipeline systems.

14 The same principles will apply
15 to the remaining parts of the supervisory control system,
16 which will be headquartered at the Yellowknife dispatch
17 office, and which will have back-up facilities at each
18 of the three district offices of Inuvik, Norman Wells
19 and Fort Simpson.

20 The supervisory system will be
21 designed so that a single gas dispatcher at Yellowknife
22 will be capable of operating and controlling the pipeline
23 satisfactorily, with the aid of a computer and related
24 pipeline operations programs. The station will be --
25 the stations will be designed so that they are self-
26 sufficient, fail-safe and locally smart. By self-
27 sufficient, we mean that nearly all stations will depend
28 upon their own equipment for the generation of utility
29 requirements such as power, water and compressed air.
30 The sole exceptions might be the metering stations located

1 near to the gas plants, where arrangements may be made to
2 purchase power.

3 In any event, these metering
4 facilities will have back-up power sources, allowing
5 operation for a limited period of time in the event of a
6 gas plant failure.

7 The term "fail-safe" refers to
8 a design philosophy, in which it is inherent that all
9 foreseeable equipment failures will result in an equip-
10 ment shutdown in such a way that the integrity of the
11 pipeline and station equipment is protected.

12 The term "locally smart" refers
13 to a design approach which allows the station automation
14 equipment sufficient latitude to operate in a safe manner
15 for long periods of time in the event of a communications
16 or supervisory control failure.

17 These principles are not new
18 and have been tried and proven on the existing Alberta
19 Gas Trunk Line system over the past several years. We
20 are confident from our knowledge of the Alberta Gas
21 Trunk Line that unmanned operation is possible, and
22 desirable, especially in areas as remote as those in
23 which the stations will be located.

24 Q In the Foothills' appli-
25 cation, reference is made to a maintenance information
26 system for compressor stations. Will you comment on
27 this?

28 A The supervisory control
29 system and local controls which I talked about briefly
30 in response to the last question, are necessary and

1 sufficient to support unmanned operations. However, we
2 are planning a further refinement, particularly at com-
3 pressor stations which will involve a sub-system to the
4 supervisory control system, and which is referred to as
5 the maintenance information system. This will be a daily
6 gathering computer base system, which will be programmed
7 to calculate various operating parameters relating to
8 the life expectancy of major components at each station.
9 By instrumenting all rotating and major process equip-
10 ment adequately, we will be able to gather automatically
11 sufficient parametric data on the equipment of concern
12 to us, so that we will be able to monitor continuously
13 life index parameters which are significant.

14 The maintenance information
15 system will be capable of continuously gathering signi-
16 ficant data, and of performing calculations on this data.
17 Significant departures from predicted life indices for
18 equipment will be flagged to the dispatcher's attention
19 at Yellowknife, and to the district offices by means of
20 audible alarms and visual parametric indications.

21 Upon receipt of these alarms,
22 and upon analysis of parameters leading to the alarms,
23 appropriate preparations will be made at the district
24 offices to assemble maintenance teams and equipment.
25 Station shut-down will be scheduled at an appropriate
26 time to provide a minimum disruption of the total pipe-
27 line operation.

28 Interim steps by the gas dis-
29 patcher may be taken to reduce power levels at the stat-
30 ion so that an imminent predicted failure can be

1 forestalled until proper maintenance procedures can be
2 taken. In this way, it is anticipated that many unsched-
3 uled equipment shut-downs can be avoided and further,
4 that preventative maintenance visits to the stations will
5 be reduced.

6 Q Mr. Lazerte, you are the
7 supervisor of station design at Foothills Pipelines
8 Limited?

9 WITNESS LAZERTE:

10 A Yes.

11 Q And you appeared before
12 this Inquiry on an earlier panel?

13 A Yes.

14 Q Will you explain how you
15 selected the size of the area required for the compressor
16 stations and explain how this differs from Canadian
17 Arctic Gas; also please explain the general layout of a
18 typical Foothills chilled compressor station?

19 A Any compressor station
20 layout is evolved in stages and goes through many revi-
21 sions and up-dates. The Foothills layout for a chilled
22 station, was no different and the resulting product
23 reflected the thinking of engineering designers, and the
24 operations and maintenance personnel. Undoubtedly, there
25 will be further revisions when the detailed design is
26 carried out, but this layout is adequate for the purpose
27 of preliminary design and costing.

28 Initially, we reviewed the
29 layout of several recently constructed AGTL stations in
30 Alberta with particular reference to acreage requirement,

Mirosh, Lazerte, Beer
In Chief

1 building number, size and location, line size and locat-
2 ion, and the general overall arrangement.

3 The major equipment was sized
4 and equipment laid out in each building. From these
5 layouts, and after providing for maintenance room and
6 walkways, it was possible to predict the size of build-
7 ings required. For example, it was decided we would
8 house both the gas and propane compressor units in one
9 building and, with these units sized at 24,000 and 15,000
10 horsepower respectively, it was possible to get typical
11 drawings, layout the packages and size the building at
12 50 feet by 110 feet. Similarly, the size of the chiller
13 building became 50 feet by 75 and so on.

14 From the simplified mechanical
15 flow sheet, which shows the general hookup of the major
16 equipment, connecting lines and instrumentation, it was
17 possible to arrange the buildings and equipment so that
18 the flow is reasonably straight through with minimum
19 pressure drop and pipe requirements. In other words, the
20 layout was simplified.

21 Giving due consideration to
22 accepted practices in setting the distance from the main
23 transmission line to buildings and the spacing between
24 buildings themselves, a general layout was prepared
25 showing the main line, compressor and chiller buildings,
26 major equipment, storage, housing, roads, flare, heliport
27 and sewage lagoon. This general arrangement was also
28 worked over and checked with particular reference to
29 safety, applicable code requirements and published data
30 from companies insuring this type of facility.

Mirosh, Lazerte, Beer
In Chief

1 More specifically, the layout
2 selected had to meet the following criteria:

3 Pipe, building and equipment
4 must be spaced so that the operation is safe. Failure
5 of a given piece of equipment should not jeopardize the
6 entire station. An example of this is the distance from
7 the 42 inch mainline to the compressor building which we
8 set at approximately 140 feet. Another obvious example
9 is the flare, which is set well away from the hazardous
10 operating areas.

11 2. The site be as compact as
12 possible to minimize the effect on the environment.
13 Obviously, an 11 acre site will have significantly less
14 effect on the environment than one double this size.

15 The arrangement of equipment
16 and buildings must meet all applicable Codes. For
17 example, buildings with standard electrical fittings
18 must be a specific distance away from hazardous operating
19 areas.

20 4. The layout must satisfy
21 the requirements of those personnel that operate and
22 maintain the machinery and equipment. For example, the
23 control room while not classified as a hazardous area,
24 must be located so that it yields easy access to the
25 various operating areas and still satisfies safety
26 requirements. Shops and stores are placed such that
27 equipment could be moved back and forth as necessary to
28 accommodate repairs.

29 5. The road network should
30 be such that equipment and personnel can move smoothly

1 around the station site as required.

2 6. The living quarters were
3 placed remote from the operating areas.

4 7. The overall arrangement was
5 such that the cost of the installation was minimum, con-
6 sistent with a high quality, high efficiency type of
7 compressor station operation. The end result for our
8 chilled stations is as shown on this slide, and it shows
9 we occupy a site area of 11 acres.

10 Incidentally, the area for
11 future expansion is some two to three acres, and is to the
12 bottom of the picture and is not shown.

13 The colours shown here are
14 slightly misleading. The green are buildings, however
15 these are propane condensers and are not buildings
16 so we have seven buildings in total.

17 I will just start out and give
18 you the main buildings, and then we can get to the
19 supporting facilities.

20 THE COMMISSIONER: Mr. Lazerte,
21 do you want to use this?

22 A Firstly, it might be best
23 to start with the main transmission line coming down, and
24 it's shown on this side of the slide, so the pull through
25 this station down the main 42 inch line, down the 42
26 inch main line on in through the station, through an
27 inlet scrubber which is housed here, through the gas
28 compressor or booster on through through the chilling
29 building, through the chillers and back on out, down the
30 main line approximately 48 miles to the next station.

Mirosh, Lazerte, Beer
In Chief

1 The station valving, some of the
2 station valving is shown here. This is a main line
3 block valve which is used in event of emergency to block
4 off the main line. Pig trap shown here, the two
5 station side valves again which would close in the event
6 of a station emergency are also shown here. That basic-
7 ally is the main gas flow through the station.

8 Q Where the main line block
9 valve is that you described, can the gas by-pass the
10 station through there in the event that some of those
11 units go down?

12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Mirosh, Lazerte Beer
In Chief

1 A The way this operates is,
2 that of course this just shows some of the piping and
3 doesn't intend to portray all of it but there is another
4 key valve that is shown here and the way this operates,
5 there is a check valve downstream of this main block.
6 So with this station operation, this valve is sitting
7 open, this check valve, holds the differential on the
8 stations, that is the gas comes on through, there is
9 about 150 pound differential across this station, it
10 cannot get back through here because of this check
11 valve here. So this valve will run open, the check
12 valve, we'll ensure the pressure drop across the
13 station.

14 Continuing with the buildings,
15 we have covered the main two process buildings, I
16 pointed out propane condensers, there are 22 large
17 condenser bundles here, we've just shown them blocked in
18 in two banks. This building Number 9 really is a
19 combination of four buildings, the control room sits
20 in here, control the whole operation, utility building,
21 power generation in here and the motor control centre
22 and office, all in this very large building here.
23 This is a stores building, cold storage. there would be
24 no heat in this building and if there is, it would be
25 of such a temperature that it would not have a problem
26 with any foundation design on that particular building.

27 The living quarters are shown
28 here and the buildings shown, the size shown, is for
29 a 28 man station. In other words not 28 man station,
30 but 28 men can be quartered in there for periods of high

1 maintenance.

2 Now I believe that covers most
3 buildings --

4 Q Building Number one.

5 A Oh, excuse me, this is the
6 communications tower, and we've shown a small building
7 at that point.

8 The road network is in brown
9 and it's self explanatory. I don't think I need to go
10 into that. The number five area is equipment storage
11 and of course, that's for things like snowploughs and
12 anything like that that might sit outside.

13 Water storage here, normally
14 1000 barrels. Please note the flare and incinerator
15 shown well off away from the processing areas.
16 The final design of course not completed on this but
17 there will be a large diameter line running on above
18 ground, running on over to the flare and incinerator.

19 This is pipe storage.

20 Number 3, heliport and notice that it's inside the
21 fenced area. This is the fenced area that we've shown
22 here. And 14 being the sewage lagoon. This is shown
23 as a brown area. Actually this is the area where the
24 propane storage tanks will be. Five hundred barrels of
25 propane storage in the event that the propane unit is
26 blown down and we need to bring some more propane in,
27 that will be a very rare occurrence that propane will
28 be brought in from there.

29 MR. GIBBS: Might the photographs
30 of that slide be marked sir, 246.

(PHOTOGRAPHS OF SLIDE MARKED EXHIBIT 246)

A I covered some of the material in the text while I was at the board, but if you'll allow me I'll just read from the text.

It is compact and meets all our requirements. The CAGPL stations occupy areas varying from 14 to 25 acres and they have more buildings. Also shown on the plot plan is pipe storage area, 100 by 125 feet which is more than enough to allow for storage of large and small pipe, valves, fittings, glycol mixes and lube oils. The smaller repair parts and equipment spares will be kept in the stores buildings or in the shop at those stations not having a stores building.

The 100 by 150 foot helicopter pad is located south of the pipe storage area and well away from the operating facilities.

The 75 foot by 75 by five foot deep sewage lagoon is located in the corner of the yard south of the helicopter pad. The flare stack and incinerator are placed well away from the process area. A minimum flare stack of 100 feet is planned. The incinerator will handle emergency disposal of pipeline condensates that are not trucked, plus combustible solid wastes.

For convenience, we grouped the utility and control rooms, motor control centre, shop and office buildings together under one roof, a 60 by 120 foot total area. Utilidors connect all buildings.

Q Please explain what gas

1 chilling systems are, why we need them and where they
2 are located on the Foothills system?

3 A The Foothills proposal
4 is to construct a 42 inch buried pipeline from Taglu
5 and Parsons Lake south to the 60th Parallel. One of
6 the most fundamental points in the design is that
7 in those areas of continuous permafrost, the gas must
8 be kept cool or chilled, that is below freezing, in
9 order that we do not melt the materials surrounding the
10 pipeline. I believe that this concept is now accepted
11 by all people familiar with the proposal to build this
12 line and the consequences of not doing so do not need
13 to be reviewed at this time. Suffice it to say that the
14 gas, when flowing in the buried pipe, in the continuous
15 permafrost regions, must be kept below 32 degrees
16 Fahrenheit at any point in the pipeline. A reasonable
17 margin of safety is desirable so we used 25 degrees
18 Fahrenheit for our design.

19 The gas will be delivered to
20 us from the Taglu and Parsons Lake plants at 25 degrees
21 Fahrenheit and it is necessary to keep it chilled when
22 flowing in the buried pipe between compressor stations.

23 THE COMMISSIONER: Excuse me,
24 Mr. Lazerte, we are returning to all of these concepts
25 for the first time since I think May, so forgive me if
26 I'm not quite with you. It's delivered to you from
27 Taglu and Parsons Lake at 25 degrees Fahrenheit. Is it
28 then chilled at the gas plant before it enters the
29 pipe?

30 A That is correct.

1 Q That's a proposal that both
2 Arctic Gas and Foothills has made is it?

3 A As I understand it, yes.
4

5 Q Chilling at the gas plants?

6 A Yes.

7 THE COMMISSIONER: Sorry.

8 A The ground temperature
9 immediately above the pipeline varies seasonly between
10 about 20 degrees Fahrenheit in January and 36 degrees
11 Fahrenheit in October. So the heat can flow both ways
12 at various times. From pipe to soil or from soil to
13 pipe. Of assistance to us is the fact that as the gas
14 travels south between compressor stations, it drops
15 in pressures, expands and cools. We can calculate the
16 arrival temperature of the gas at the first compressor
17 station downstream of the processing plant under all
18 seasonal temperature variations, making sure we remain
19 below 32 degrees Fahrenheit.

20 Of course, compressor stations
21 are required at various points on the line to boost
22 the gas pressure and keep it moving south. This increase
23 in gas pressure as opposed to the cooling, when the gas
24 expands down the line, heats the gas and we call this
25 the heated compression. This heated compression must
26 be removed from the gas prior to piping it back under-
27 ground to continue its journey south to the next com-
28 pressor station, and this heat removal is accomplished
29 in a propane refrigeration unit.

30 The propane refrigeration

1 cycle is a very simple one, and as the name implies.
2 the chilling medium used is propane. This liquified
3 petroleum gas, or LPG, is produced in many of Alberta's
4 gas plants and probably will be produced at the
5 Parsons Lake plant. Stored under pressure, it is a
6 liquid at normal temperatures and it vaporizes with a
7 pressure reduction.

8 The warm pipeline gas discharged
9 from the pipeline booster flows to the chiller where it
10 passes through and is contained inside a series of steel
11 tubes, the other sides of which are in contact with the
12 cold propane. As a result heat flows from the warm gas
13 to the cold propane. The gas is chilled, and can again
14 pass underground. The propane takes on the heat,
15 vaporizes or boils, and the propane vapour is then
16 compressed to a higher pressure where it can be
17 recondensed by aerial cooling and flows back to the
18 chiller to complete the closed cycle.

1 One of our design concepts was
2 that we would operate the pipeline chilled north of the
3 Mackenzie River at Fort Simpson and above 32 degrees
4 Fahrenheit, and unchilled south of this point in the
5 discontinuous permafrost. Therefore, we require propane
6 chilling units at the northern 13 stations to get the
7 gas to Fort Simpson below 32 degrees Fahrenheit.

8 Q Please explain your
9 approach towards permanent water supply and sewage dis-
10 posal at the compressor stations?

11 A Our plans for water supply
12 are preliminary. For storage, we plan to install a mini-
13 mum 1,000 barrel capacity, galvanized bolted tank at
14 each station. Stations remote from a water source will
15 have 2,000 barrels. Tanks will each have a heating coil
16 installed near the bottom to prevent freezing and will be
17 insulated.

18 The quantity of water required
19 will not be large, as the stations will ultimately run
20 unattended, with only periodic visitations from operating
21 and maintenance personnel. Maximum water requirements
22 will coincide with periods when major overhauls and main-
23 tenance are occurring. We are planning four stations
24 with living quarters with 28 man accommodation (remote),
25 nine stations with 12 man accommodation (semi-remote),
26 and four stations with no accommodation as they are
27 easily accessible. If we assume no replacement of stored
28 water, the planned 1,000 barrel storage tank would last
29 about 10 days with 28 men quartered at the station. As
30 we will, in fact, have a replacement source, this storage

1 volume is considered adequate.

2 At this time, it is impossible
3 to state where we will obtain our water supply and further
4 field investigation, including environmental studies,
5 will precede final design of these facilities. However,
6 depending on the particular location, we will be investi-
7 gating the following sources:

8 Ponds and lakes, reasonably
9 adjacent to a site;

10 Rivers and streams;
11 Drilled and cased wells.

12 If none of the above are avail-
13 able, we will be forced to haul our water in from the
14 nearest available source.

15 Potable water for drinking and
16 cooking will have to meet all purity and quality stand-
17 ards, no matter what its source. In certain instances,
18 where good quality water is not available locally, we
19 may find it more practical to haul the small quantities
20 of potable water required at a station and supply separate
21 storage for it. Untreated water would then be used only
22 for laundry, showers, washing and toilets.

23 Assuming a nearby lake, river
24 or stream as a permanent water source, it will be
25 necessary to construct a water intake, heated pump house
26 and small diameter distribution line between the source
27 and the station. Generally, these facilities will be of
28 conventional design, but modified as required where per-
29 mafrost exists and dictates foundation conditions or
30 intake design. The water distribution line will probably

Packaged treatment units preferred are the physical-chemical process and the biological or activated sludge treatment process.

Sewage lagoons are relatively shallow basins constructed to provide a uniform water depth of approximately 5 feet. They are lined with clay or other impervious material to prevent seepage and so that the sewage is retained in the pond for a considerable period of time. The organic matter contained in the sewage is broken down into stable inoffensive products. In addition, potential disease producing organisms are removed or greatly reduced in number during the slow passage of sewage through the lagoon. It is important that the pond not be overloaded and that sufficient sunlight reaches the pond surface. A high

1 degree of treatment can be expected during the months of
2 Arctic summer, but this action will be very slow during
3 winter. For this reason, it is thought that it may be
4 practical to enter each winter season with a very low
5 level in the pond and let it build up until the active
6 summer period arrives and treatment commences.

7 Studies by a consultant employed
8 by Foothills indicate the use of swampland shows some
9 promise for disposing of the treated effluent from stat-
10 ion sewage lagoons. Also, assimilation of treated sewage
11 effluent by land other than swampland can be considered
12 in the north, particularly where an active layer of a
13 depth over 18 inches is encountered. Any release of
14 sewage lagoon effluent to swampland, land other than
15 swampland or a water course would be very carefully con-
16 trolled and would be limited to the summer period when
17 lagoon treatment is at a high level. Tests on the
18 effluent would precede any release to ensure it meets
19 the standards set by regulatory agencies.

20 I would like to add just one
21 comment before going on, and that is that our design
22 on sewage disposal is at a very preliminary stage, and
23 these were comments of a general nature only. Detailed
24 design will of course follow much later on.

25 Q Mr. Beer, you are a
26 senior engineer in the engineering department of Foot-
27 hills Pipe Lines Limited?

28 WITNESS BEER:

29 A Yes, I am.

30 Q Does the sheet attached

Mirosh, Lazerte, Beer
In Chief

1 to the prepared evidence, and having your name at the
2 top, accurately describe your academic qualifications and
3 your experience?

4 A Yes, it does.

5 Q Would you read it into the
6 record, please?

7 A Education: Engineering
8 apprenticeship, Royal Aircraft Establishment, Fnoiland,
9 1957 to 1962. B.Sc., Aeronautical Engineering, 1962.
10 M.Sc., Thermodynamics, University of Birmingham, England,
11 1963.

12 Experience: 1963 to 1967,
13 Ministry of Aviation, England. Work included development
14 testing at the National Gas Turbine Establishment of a
15 small gas turbine for naval application in co-operation
16 with industry and the Royal Navy.

17 1967 to 1974, Westinghouse
18 Canada, Hamilton. 1967 to 1972 as a project engineer
19 responsible for the application of gas turbines in the
20 pipeline and utility industries in Canada and the U.S.
21 In 1972 to 1974, senior engineer, managing gas turbine
22 applications group for orders in the utility industry;
23 also conducted technical negotiations and design reviews
24 with customers world wide.

25 1974, Foothills Pipe Lines,
26 senior engineer responsible for compression and utility
27 equipment.

28 Q And you were involved in
29 the selection of the compressor equipment at the Foot-
30 hills Pipe Lines Compressor stations?

Mirosh, Lazerte, Beer
In Chief

1 A Yes, I am.

2 Q Based on the horsepower and
3 colling requirements for the compressor stations, as
4 determined by the hydraulic studies, would you explain
5 what types and sizes of major rotating equipment are
6 required, and whether they are available in Canada?

7 A As you know, our hydraulic
8 studies showed that for the flowing volumes and pipe
9 parameters proposed for the Foothills system, seventeen
10 compressor stations will be required. Of these, the
11 northern thirteen will contain gas compression and chill-
12 ing equipment, three will contain gas compression equip-
13 ment only, and the most southerly station, number seven-
14 teen, will have gas compression and aerial cooling equip-
15 ment. In the northern thirteen stations, the gas chilling
16 systems require propane compression. The gas cooling at
17 Station 17 will be achieved using large fan driven
18 radiators.

19 Compression, whether of natural
20 gas or propane, will utilize centrifugal compressors of
21 one or more stages, each driven by a gas turbine prime
22 mover. For each of Stations 1 to 14, the natural gas
23 compression requirements will be met with a single 24,000
24 horsepower nominal gas turbine driving a centrifugal
25 compressor. For each of Stations 15 to 17, there will be
26 a single 30,000 horsepower nominal gas turbine driving a
27 centrifugal compressor. For stations -- for each of
28 Stations 1 to 13, the gas chilling requirements will be
29 met with a propane refrigeration system utilizing a
30 centrifugal propane compressor driven by a single 15,000

1 horsepower nominal gas turbine.

2 Our discussions with manufact-
3 urers of these types and sizes of equipment show that a
4 significant part of each turbine compressor set would be
5 manufactured in Canada and be shipped from Canadian
6 plants. The turbine and compressor industry being inter-
7 national in nature, all Canadian suppliers of such equip-
8 ment import some parts from the U.S. or Europe. The
9 overall Canadian content depends on the individual manu-
10 facturer, but may range up to 90 percent.

11 Q Would you explain why you
12 selected gas turbines for prime movers at compressor
13 stations, and would you explain, in general terms how they
14 work, especially related to station compression and
15 chilling loads?

16 THE COMMISSIONER: Excuse me,
17 Mr. Beer. You are about to discuss the advantages of
18 gas turbines over reciprocating engines and electric
19 motors. I must have been told, but I've forgotten, what
20 is Arctic Gas using?

21 A Gas turbines, sir.

22 THE COMMISSIONER: All right.
23 So these advantages are advantages accruing to both
24 applicants then?

25 A Yes, indeed.

26 In natural gas pipelines,
27 three types of prime mover are commonly considered, i.e.
28 gas turbines, reciprocating engines and electric motors.
29 Gas turbines are selected for a large percentage of
30 pipeline applications, since they offer significant

Mirosh, Lazerte, Beer
In Chief

1 advantages over the other types of prime mover.

2 Some of these advantages become
3 even more significant when one considers the region through
4 which our proposed pipeline will pass. They include:

5 (a) Compactness and relatively
6 light weight. In comparison, an electric motor is heavier
7 than a gas turbine of equivalent power; reciprocating
8 equipment would be several times heavier and larger.

9 The use of gas turbines thus results in smaller building
10 and foundation requirements than either of the other
11 two and the compressor stations are thus more compact.
12 In the Northwest Territories, the logistics and trans-
13 portation problems will be minimized by use of gas tur-
14 bines, not just for the equipment itself but in relation
15 to building, fill, and foundation materials.

16 (b) Simplicity and flexibility
17 of operation. A gas turbine has relatively few moving
18 parts in contrast to reciprocating engines, making for
19 relatively low maintenance requirements. Electric motors
20 have only one moving part as such, though the require-
21 ments of matching it to a centrifugal compressor may
22 dictate the use of a gearbox, in addition to which the
23 required flexibility of operation would result in an
24 extremely sophisticated and complex control system. The
25 special expertise for the maintenance of such controls is
26 currently limited to only a few individuals and companies
27 and takes years to achieve. Thus it was not considered
28 practical for a northern pipeline in a remote region.

29 (c) Fuel economy. The most
30 up-to-date gas turbine designs achieve a 34-35 percent

Mirosh, Lazerte, Beer
In Chief

1 thermal efficiency and operate very successfully on nat-
2 ural gas drawn from the pipeline. Reciprocating engines
3 also have good fuel economy and operate on natural gas,
4 whereas electric motors require power generated on site
5 or brought in from commercial sources.

6 On site generation would re-
7 quire another prime mover for the generator. One might
8 just as well connect this to the compressor direct and
9 avoid the extra equipment and expense. There are no
10 existing sources of commercial power in the north large
11 enough to supply the several hundred megawatts necessary
12 to power the pipeline.

13 Preliminary discussions with
14 Northern Canada Power show the existence of sufficient
15 hydroelectric potential in the region, but power would
16 probably not be available in the time frame proposed for
17 this pipeline, in addition to which, the cost of power
18 delivered to the station would be considerably in excess
19 of the projected cost of the natural gas fuel taken from
20 the pipeline.

21
22
23
24
25
26
27
28
29
30

1 Now as to how a gas turbine
2 works, it may be useful to look at this diagram.

3 It's an internal combustion
4 engine which, in its simplest form, air is drawn from
5 the atmosphere here into the compressor, which is
6 compressed and passed through the combustion chamber
7 in which fuel in this case natural gas, is burned
8 continuously. The resulting hot pressurized gas is
9 then passed through the turbine, and expands down to
10 atmospheric pressure, producing mechanical power.
11 Some of that mechanical power is used to drive the
12 compressor, which compressed the air in the first place
13 and the balance is used to drive the load whether it be
14 in this case a pipeline compressor, a propane compressor
15 an electrical generator or even a ship's propeller.

16 In practice of course,
17 particularly in pipeline applications and in the more
18 recent designs for high efficiency, gas turbines can be
19 somewhat more complex. For example, they're commonly
20 divided into two parts as shown in the second diagram.

21 MR. GIBBS: Might that first
22 diagram sir become Exhibit 247.

23 (DIAGRAM - SIMPLE GAS TURBINE, MARKED EXHIBIT 247)

24 A In this diagram, the
25 turbine, as I say is divided into two parts. (a) the
26 gas generator, which consists of an air compressor
27 combustion chamber and a high pressure turbine.
28 This latter derives just enough power to drive the
29 compressor. Gas is expanded from a high pressure to an
30 intermediate pressure in this process and from that

1 intermediate pressure, it is ducted through an aero-
2 dynamically designed duct, into the low pressure turbine
3 and the expansion from that intermediate pressure, to
4 atmosphere generates sufficient power for the load in
5 this case, the centrifugal compressor.

6 The split between the gas
7 turbine and power turbine shafts enables good thermal
8 efficiency to be maintained over a much wider range of
9 output speeds, than is possible with a single shaft
10 unit, making it more suitable for pipeline applications.

11 MR. GIBBS: Might that one sir
12 be marked Exhibit 248.

13 (FIGURE TWO, TWO SHAFT GAS TURBINE MARKED EXHIBIT 248)

14 A Gas turbine prime movers
15 for pipeline and other non-aircraft applications, fall
16 generally into two groups. One is derived from aircraft
17 engines where, in design, light weight and high efficiency
18 are predominant considerations. In this type, the
19 modified aircraft engine becomes the gas generator, with
20 a power turbine being added to match. The other group
21 is called heavy duty or industrial, and design originally
22 concentrated on reliability and low first cost, rather
23 than on fuel economy or light weight. with the result that
24 the gas generator is much larger and heavier than an aircraft
25 engine.

26 Development has resulted in
27 resulted in significant improvement in the reliability of
28 aircraft derivative units, so that for some machines,
29 it is now comparable with that of heavy duty type gas
30 turbines. There has been also an increase in the thermal

1 efficiency of heavy duty gas turbines by increasing
2 engine pressures and temperatures, so that in the latest
3 designs, it is fairly close to the more recent aircraft
4 derivative units.

5 Of course, I have only talked
6 in general terms about the gas turbine engine itself.
7 In an actual turbine compressor set, there are many other
8 pieces of equipment and subsystems. associated with
9 it, such as, the fuel system, the lubricating and seal oil
10 systems, the air inlet system including filter, silencer
11 duct work and supports, the exhaust system, including
12 silencer, ductwork and supports, the control system
13 and the mounting bases or skids on which the gas
14 turbine and centrifugal compressor are mounted, together
15 with subsystem components and necessary piping and
16 wiring.

17 Q Can you explain the noise
18 criteria you have adopted for compressor stations and how
19 you have arrived at them?

20 A Noise, which can be defined as
21 unwanted sound, is inevitable in any rotating power
22 equipment, where the movement of air is involved. The
23 level generally depending on the amount of power. In
24 the case of the large gas turbines and compressors
25 proposed for our stations, individual equipment
26 noise level is quite high. Since these levels are
27 generally too high to be tolerated, some noise
28 attenuation measures are taken at all pipeline compressor
29 stations. The degree of these measures depending on
30 noise level which one wishes to attain.

Thus, during design, one must consider the impact of noise on the compressor station environment, several different factors being involved, including,

(a) station location relative
to populated areas

(b) the exposure of personnel
to station noise, related to working conditions and
living quarters

(c) the sensitivity of wildlife
in the area to station noise and

(d) the effect of terrain and meteorological conditions on the noise propagation from the station.

Our pipeline will pass through a sparsely populated region, and no compression station is expected to be less than seven and a half miles from the nearest community. Thus the degree of noise attenuation required to satisfy community concerns is expected to be minimal. It may be interesting to note here that in Alberta there are some compressor stations located about two miles from the closest community, with individual homes in the order of one half mile away. It has proved possible to silence these stations sufficiently to prevent adverse community reaction.

With respect to the exposure of personnel at compressor stations, regulations exist in every province as to the duration of permissible exposure to noise, as shown on this table.

What is shown here really is

1 the regulations existing in Alberta, which are very
2 similar to those all across the country and identical,
3 I believe, with the federal regulations. And in
4 addition, I've added some other pieces of general
5 information which I hope will give some idea of what
6 these noise levels really mean, in terms of everyday
7 equivalents which most people are probably familiar
8 with. In general the regulations start at this level
9 here, in other words, for a sound level of 80 dB's
10 which is like a moderately busy city street, the
11 maximum exposure permitted on a daily basis is 16
12 hours. Any noise level below that intensity generally
13 has no restriction on the time and so I've just shown
14 a dash here. As the noise increases and increases,
15 the permitted exposure decreases. This is exposure
16 without any form of hearing protection; whatever.
17 As you can see, this diagram over here.

18 THE COMMISSIONER: You're
19 talking about Workmen's Compensation noise exposure
20 standards?

21 A That kind of thing. In
22 this case sir it's the Alberta Public Health Act, not
23 the Workmen's Compensation Board as such.

24 Q I wasn't sure, the authority
25 who drew these things up, That's what they're thinking
26 of --

27 A Yes, indeed. And these
28 levels are fairly commonly accepted now across Canada
29 and in fact in the United States as well, both
30 provincially, federally and in the U.S. state level.

1 Q Well where -- now your
2 compressor station on this chart would be -- the exposure
3 would be 24 hours a day.

4 A Not necessarily sir. The
5 maintenance personnel are not in the final event expected
6 to be on site for always the 24 hours a day.

7 Q Forgive me. I'm thinking of
8 -- let us suppose this. There's somebody standing
9 -- let's suppose you built next to a village, just for
10 the sake of argument. The exposure of the villagers
11 would be 24 hours a day wouldn't it?

12 A Yes indeed but in fact we're
13 not proposing to do that. If in fact we did find
14 ourselves obliged for some reason to put a compressor
15 station next to a village/^{or} a community a considerable
16 amount of extra attenuation would be required from what
17 we're generally proposing.

18 Q Well, you must have said
19 this but once again I just want to make sure. On the
20 -- where would you put your compressor station on the
21 scale?

22 A In approximately this
23 area sir. We hope to be able to attain approximately
24 60 dBA at the station fence line. That's not within
25 compressor buildings or anything like that, but at the
26 station fence line.

27 Q So that someone standing
28 at the station fenceline, the decibal level would be
29 no greater than if he were conversing with someone at
30 the station fenceline?

1 A Yes, at a reasonable level.
2 That's not to say that the conversation would necessarily
3 drown the turbine out. You would still hear it of
4 course because of the frequency bounce but it would
5 not be anything in the way of a distressing or aggravating
6 level.

7 MR. GIBBS: Could that chart
8 sir become Exhibit 249.

9 THE COMMISSIONER: Yes.
10 (TABLE: PERMISSIBLE NOISE EXPOSURE MARKED EXHIBIT 249)

11 A The decibel or dB is a
12 measure of the level of sound, and sound given in dBA
13 such as I've shown on the chart, is the absolute level
14 corrected for the sensitivity of the human ear to various
15 sound frequencies. In this table I -- well I've covered
16 a lot of that stuff.

17 For the living quarters. it's
18 desirable to have lower noise levels than those shown in the
19 table -- approximately 65 dBA by day and 50 dBA by
20 night.

21 With respect to wildlife in the
22 vicinity of compressor stations recent studies^{have}/shown
23 ^{some} that/species do not react adversely to moderate levels
24 of continuous noise such as would normally be emitted
25 from compressor stations, though there is evidence from
26 these studies that caribou, for example, would be reluctant
27 to approach within about one eighth of a mile of a
28 continuous noise source. It appears reasonable to suppose
29 that some disturbance would occur in breeding areas, and
30 during sudden changes in noise levels as during emergency

1 station blowdown. Observations at some more remote
2 compressor stations in Alberta shown that animals such
3 as moose, elk and black bears come right to the
4 fenceline. In addition, some types of birds have built
5 nests within compressor station boundaries, some even
6 becoming quite a nuisance at times "protecting" those
7 nests.

8 We propose to identify noise
9 sensitive wildlife in the vicinity of the pipeline
10 and consider this in finalizing station noise criteria.

11 The effects of terrain and
12 meteorological conditions on noise propogations will
13 vary from station to station. And these will be
14 studied in detail at final design. Some general
15 observations are perhaps appropriate however.

16 (a) Terrain can have a very
17 significant effect on noise propogation. For example,
18 rolling terrain will impede noise much more than flat.
19 Any topographical feature which acts as an obstacle
20 between a noise source and listener can be
21 regarded as a noise barrier, although lower frequencies
22 may bend around or over the obstacle and still be heard.
23 Canyons and valleys may serve to contain noise and assist
24 its propagation along their length.

25 (b) Vegetative cover helps
26 to attenuate noise, and grassland and thick tree cover
27 can have significant effects. By contrast, as we all know,
28 hard rocky surfaces have very little attenuating effect.
29
30

Mirosh, Lazerte, Beer
In Chief

(c) Since sound travels through air, wind direction and velocity affect its propagation.

(d) On a warm, sunny day, when air temperature decreases with height, sound waves tend to get bent upwards. During temperature inversions, when temperature increases with height, the sound waves tend to get bent downwards and travel greater distances along the ground.

(e) Relative humidity has some influence, attenuation decreasing as relative humidity increases. It has a greater influence on high frequencies than low frequencies.

Considering the factors I have just outlined, together with the equipment proposed for our compressor stations, we propose to establish maximum continuous noise levels at the station fence line in the order of 80 dB, or about 60 dBA which as you saw from the table would approximate to the normal levels of conversation. Where special community or wildlife concerns require it, we will apply extra attenuation measures to reduce station noise to more acceptable levels.

In addition to the continuous noise levels generated by the compression and other equipment, intermittent and infrequent bursts of noise will be generated, the loudest being from the station blowdown system. Some noise attenuation measures can be taken, but it is considered unrealistic to reduce levels to that of continuous station noise. For example, station blowdown involves the expansion of gas from 1250 PSIG to atmospheric pressure very quickly, resulting

Mirosh, Lazerte, Beer
In Chief

1 in an extremely high noise level. Silencing would reduce
2 this rate of expansion, though too much reduction could
3 extend the blowdown time so as to jeopardize the station
4 in an emergency situation.

5 In this case, we propose to
6 establish a maximum intermittent noise level of 90 dB,
7 approximating to a motorcycle passing by at 25 feet.
8 During emergency blowdown, noise levels could be above
9 the station -- the normal station levels for up to two
10 minutes.

11 Q Can you explain what the
12 composition of the gas turbine exhaust will be and, in
13 general, how this will affect air quality in the vicinity
14 of the compressor station?

15 A The modern gas turbine,
16 when operated on natural gas, is perhaps the most clean
17 burning engine in existence. For example, typical
18 ranges for maximum exhaust emissions from the gas turbines
19 we have under consideration are:

20 Oxides of nitrogen (NOX),
21 90 to 115 parts per million;

22 Carbon Monoxide, 15 to 50 parts
23 per million;

24 Unburned Hydrocarbons, 5 to 15
25 parts per million;

26 Sulphur Dioxide -- depends
27 on the sulphur concentration in the fuel. This is
28 currently expected to be quite low.

29 Perhaps I should add here that
30 this obviously only represents a very small part of the

1 total exhaust. The remainder is oxygen and nitrogen,
2 a very large percentage.

3 We propose to have the gas tur-
4 bines at our compressor stations exhaust vertically up-
5 wards, and there are a number of factors which affect
6 the resulting ground level concentration of these emis-
7 sions. Some, such as stack heights and exhaust velocity
8 are controllable; others, such as terrain and temperature
9 inversions are not, although they can be accommodated to
10 some degree.

11 We propose to design exhaust
12 stacks to minimize ground level concentrations of
13 pollutants, probably by giving them sufficient height,
14 and creating a high enough exhaust velocity to escape stack
15 and building downwash effects. It must be borne in mind,
16 however, that increasing stack height and exhaust
17 velocity would also increase turbine exhaust back press-
18 ure, resulting in a slight loss of power and efficiency.

19 With the turbine exhaust emis-
20 sion levels I have just outlined, we had a firm of con-
21 sultants in this field conduct a study to determine
22 whether the gas turbines we propose for our compressor
23 stations would result in significant ground level con-
24 centrations. I can summarize their conclusions as
25 follows:

26 1. The exhaust velocity should
27 exceed the maximum wind velocity to avoid chimney down-
28 wash problems.

29 2. The exhaust stack height
30 should be about one and three-quarter times the height

1 of the compressor building to avoid building downdraft
2 problems.

3 3. Provided there are no
4 stack and building effects, maximum ground level NOX
5 concentrations would be about 0.018 parts per million
6 for a neutral atmosphere and irregular terrain, and about
7 0.10 part per million for inversion conditions and
8 irregular terrain. These ground level concentrations
9 are noticeably less than the 0.21 parts per million
10 that the federal government guidelines state as the
11 maximum desirable.

12 4. Ground level concentrations
13 of a given exhaust constituent are directly proportional.
14 to the stack concentration. Since the maximum stack
15 concentration of carbon monoxide is about half of that
16 of NOX, we can expect the ground level concentration of
17 carbon monoxide also to be about half of the Nox values,
18 or about 0.05 parts per million maximum, well within the
19 federal guidelines of 13 parts per million. In the same
20 way, we do not expect unburned hydrocarbons to be a
21 problem.

22 5. If we assumed a relatively
23 high sulphur concentration in the fuel gas of 10 grains
24 per 100 standard cubic feet, a stack concentration of
25 sulphur dioxide in the order of 2 parts per million would
26 result, giving a ground level concentration of 0.002
27 parts per million, well within the guideline figure of
28 0.2 parts per million.

29 Thus, we may conclude that
30 exhaust emissions from our compressor stations would not

Mirosh, Lazerte, Beer
In Chief

result in ground level concentrations high enough to cause problems relative to the federal guidelines.

Some concern has been expressed over the possible creation of large ice fog clouds during extremely cold weather, less than minus 20 degrees Fahrenheit. While it is true that ice fog is created by automobile exhausts and other combustion sources, these are of a relatively low temperature and high water vapour content. A gas turbine exhaust, by contrast will be about 7 to 800 degrees Fahrenheit with 3 to three and a half percent water vapour, and considerable dispersion will occur before temperatures fall to the dew point. Observation at compressor stations in other areas of Canada where minus 40 degree temperatures occur quite regularly, show that, while on occasion there is a tendency for a little condensation to occur high up in the exhaust plume, nothing like a fog cloud has been observed.

It may be useful to note that at certain large power stations in Alberta, where the exhaust from boilers is at about 250 degrees Fahrenheit, and contains about 12 percent water vapour, ice fog formations occur during very low temperatures, extending up to one mile from the station. The same company operates large gas turbines in the same general area, and their experience is that they occasionally form some slight condensation high in the exhaust plume, as in the case of compressor stations. This occurs at the same time as the boiler exhaust for the large power stations are generating significant ice fog formations.

Mirosh, Lazerte, Beer
In Chief
Cr. Exam. by Mr. Marshall

1 Thus we may conclude that ice
2 fog phenomenon is not likely to be a problem at our
3 compressor stations in the North.

4 MR. GIBBS: Mr. Commissioner,
5 my friends may now cross-examine the panel.

6 MR. MARSHALL: Thank you, sir.

7
8 CROSS-EXAMINATION BY MR. MARSHALL:

9
10 Q Mr. Mirosh, with respect
11 to the station pad size that's been selected by Foothills,
12 which you have indicated in your testimony at page 1,
13 answer 3 is eleven acres, could you tell me, sir, whether
14 or not that 11 acres would be a sufficient size of pad
15 in the event that Foothills determined that it ought to
16 loop its system?

17 WITNESS MIROSH: .

18 A No sir, we would have to
19 take an area adjacent to it, and we have made this general
20 allowance, but we wouldn't put the borrow material in.

21 Q How large an additional
22 area would you contemplate would be required if the
23 compressor station was being looped in a complete looping
24 program?

25 A I believe Mr. Lazerte
26 . stated an additional 3 acres would be required.

27 Q I think he described it
28 as an area for additional expansion, and I was wondering
29 just what that would include, whether it's considered
30 that that three acres would be all that would be required

1 for a complete looping of the compressor station, or
2 whether it meant something less than that.

3 WITNESS LAZERTE:

4 A The three acres would be
5 sufficient.

6 Q Have you done a plot plan
7 that would set out such a layout, sir?

8 A On the back of an envelope.

9 Q Well if it's good enough
10 for you, I suppose it's good enough for me and I would
11 like to have a look at it, Mr. Lazerte, if I might.

12 A Quite a little more
13 seriously --

14 THE COMMISSIONER: We will
15 lend you another envelope.

16 A -- we did some hand
17 sketches, I didn't retain them, I don't have them, but
18 if Mr. Gibbs desires, --

19 MR. MARSHALL:

20 Q I think that's fine, you
21 don't have them.

22 A No I don't.

23 Q You've done a rough
24 calculation as you say on the back of an envelope and
25 we'll just leave it at that.

26 A Fine.

27 THE COMMISSIONER: Mr. Marshall,
28 as I recall the acreage that Arctic Gas seeks on the
29 route for its compressor stations is sufficient to allow
30 for additional compression on looping, is it?

Mirosh, Lazerte, Beer
Cr. Exam by Marshall

1 MR. MARSHALL: Yes, sir.

2 Q Mr. Mirosh, is it intended
3 that the compressor station sites of Foothills will be
4 used as construction camp locations?

5 WITNESS MIROSH:

6 A Yes, that's the intention.

7 Q Now, would this include
8 construction camps engaged in both pipeline installation
9 and compressor station installation?

10 A Correct.

11 Q And as I understand it,
12 your camps for construction of the pipeline will be
13 roughly 4 to 500 men?

14 A Yes, in the order of 3 to
15 500.

16 Q It hasn't been made clear
17 to me yet, and it's perhaps because we haven't got your
18 construction panel, whether or not that includes the
19 inspection staff, or whether these are just the --

20 THE COMMISSIONER: and super-
21 visory.

22 MR. MARSHALL: -- and super-
23 visory.

24 A That number allows for
25 those individuals.

26 Q Do you know what percent-
27 age figure has been used in order to estimate the numbers
28 of supervisory and inspection personnel that would be
29 included on the pipeline construction spreads?

30 A No, I don't have it there

1 but I'm sure we can have it for the construction planning
2 panel.

3 Q Thank you. Have you done
4 work yet to determine whether or not at any of your
5 compressor station sites, work would be going on involv-
6 ing a ^{pipeline} construction spread operating from that site, as
7 well as work involving the construction of that compressor
8 station itself at the same time? Do you know whether
9 you are going to have two crews at the site working at
10 the same time? One building the station and one working
11 on the pipeline in the vicinity?

12 A There will be a phasing-
13 in and a phasing out period when these crews will be
14 crossing each other's paths so to speak.

15 Q Do you know what the
16 maximum size of your compressor station construction
17 crews is going to be?

18 A Perhaps Mr. Lazerte has
19 that.

20 WITNESS LAZERTE:

21 A It will be in the area
22 of maximum build-up, approximately 80 men.

23 Q What I am trying to get a
24 fix on is how many men do you think you might have work-
25 ing at this station at the moment in time, or during
26 the period in time in which construction of the station
27 itself is proceeding?

28 A On the bulk of the stat-
29 ions, what happens here is that the station construction
30 crews are moving in when the pipeline crews move out.

Q You say that's in the

1 bulk of cases, but is that in all cases, or have your
2 studies --

3 A I would have to check that
4 particular point but when we phased the thing in and
5 estimated our costs, in the work and in the tying in with
6 the construction people, this was the planning and the
7 approach, and if not in all cases, certainly in the
8 majority of cases.

9 Q But there will, even in
10 most cases, be some degree of overlap between the acti-
11 vities of the two construction crews, the one concerned
12 with the pipe itself and the other concerned with the
13 compressor station?

14 A Very little.

15 Q Do you have an analysis
16 done of the scheduling of these construction studies, or
17 construction activities that my advisors could review?
18 We are interested in this particular point.

19 A You're speaking of the
20 station construction planning?

21 Q Well we are interested in
22 the scheduling of the compressor station construction
23 and the scheduling of the pipeline construction and how
24 they inter-relate.

25 A Yes, that's shown on the
26 construction schedule, shows all the pipeline activities
27 and the station planning and it does show on that
28 schedule.

1 Q It doesn't to me provide
2 sufficient information for me to be able to determine
3 how many men are likely to be working at a particular
4 compressor station site, say compressor station 14,
5 during a particular time span. Frankly, the point of
6 the whole exercise is that my advisors doubt that you
7 could ever accommodate all of the men that you expect
8 to be working at these compressor stations - construction
9 camp sites, if they're a joint purpose site, and still
10 carry on with the construction of the compressor station.
11 You just won't have enough room to accommodate it and
12 I want to know if you've got backup data, detailed
13 scheduling studies, which show that you can work this
14 out?

15 A I don't believe this problem
16 here. Perhaps it would be helpful if I just give you
17 a few general guidelines which may be of assistance to
18 you.

19 THE COMMISSIONER: Excuse me.
20 Mr. Marshall, you're saying that on this 11 acre site,
21 that you can't have a three to five hundred man construction
22 crew building a pipeline and at the same time an 80 man
23 crew or even immediately thereafter an 80 man crew
24 building a compressor station?

25 MR. MARSHALL: There's several
26 permutations and combinations and until we have some
27 details as to how they propose to schedule this, we
28 don't know. For example, if a crew were to go into
29 first and build a compressor station, well then, according
30 to this Plot Plan that's been marked as one of the

1 exhibits, our 11 acresite is pretty well occupied. Now
2 how could we ever move in a construction crew, three
3 to five hundred man camp, and accommodate it at such
4 a site. If on the other hand they plan to have the
5 crew that's doing the pipeline installation there first,
6 but there's going to be some overlap with the crew that
7 is moving in to do the compressor station construction,
8 can they accommodate that additional number of men.
9 Beyond that, if this new crew moving in is starting
10 work in the compressor stations, aren't the pipeline
11 construction workers going to get in their way, and
12 where are they going to fit everybody in. We wanted
13 to know whether they've done any analysis and worked out
14 a schedule so that they're satisfied they can accommo-
15 date all this activity going on, on an 11 acre site.

16 A Mr. Marshall, there's no
17 particular problem here. The construction schedule does
18 not show the specific details as you want, but it does
19 show it in enough detail, it does illustrate there
20 is not a problem.

21 For example, you'll notice
22 that the pipeline construction activities are phased
23 out at the end of the -- the bulk of them are phased
24 out at the end of April. and the small station crew,
25 starting in on the planning and foundation, doesn't
26 . come in until the fourth month. Now, normally, when I
27 said 80 men, that's at the height of construction, some
28 when the pipe valves and fittings and the welding work
29 is going on, say in August. So --

30 Q How do you do a survey when

1 you've got 500 men in the construction camp, on the site.

2 A Certainly there'll be
3 some confinement of the construction crews off to the
4 side but there's no problem here.

5 Q When you say off to the side,
6 do you mean that it's still going to be on the 11 acre
7 pad or do you mean they're going to have to go someplace
8 else?

9 A No, no, I'm talking about
10 on the site. But I think it's important to realize
11 here that there is a distinct build up in activity
12 of the station crews and that in the piling stages,
13 there would be say less than 10 or a dozen men on that
14 site, and then it builds up in stages to the maximum.

15 Q I appreciate that sir, and
16 I appreciate that you don't think there's going to be a
17 problem but my advisors think there is, and what I want
18 to know is whether or not you've done detailed scheduling
19 work that convinced you that all of this activity could
20 be accommodated or are you relying on intuition. What
21 is it you're relying upon?

22 A I'm relying on my
23 experience --

24 MR. GIBBS: The witness has
25 already said how it is going to be phased in.
26 Mr. Marshall doesn't believe it so it appears to be an
27 impasse. What else he can say I don't know.

28 THE COMMISSIONER: Well, Mr.
29 Gibbs, Mr. Marshall was asking whether detailed
30 construction schedules that the Arctic Gas people could

1 examine to see if Mr. Lazerte had grounds for the
2 confidence he expressed, that's all.

3 MR. MARSHALL: I'm not
4 challenging --

5 MR. GIBBS: We will have a
6 construction panel on, as you know.

7 MR. MARSHALL: Yes, but Mr.
8 Lazerte is the one that is saying it in his evidence.
9 He's the one responsible for the layout. Is he not
10 able to help us on this?

11 MR. GIBBS: Well I thought he
12 had already done so by telling you that the pipeline
13 construction crew is gone in April and the compressor
14 station construction crew is starting to build up
15 then or May. Now that doesn't seem to be a conflict.
16 What else can he add to that?

17 THE COMMISSIONER: Excuse me,
18 are you on the construction panel, Mr. Lazerte?

19 A No, I'm not.

20 MR. MARSHALL:
21 I suppose we can answer this
22 one way or the other fairly simply. The question is
23 is whether there are more detailed studies, than are
24 found in the application materials and on the exhibit
25 that you've produced today.

26 A I rather think not. I believe
27 that the detailed studies are separate and apart, not
28 dovetailed, but I'll still stand that there's no
29 problem here .

30 Q I'll move on to another
point with Mr Mirosh. I note on the bottom of the first

1 page of your evidence and it's part of your answer to
2 question three. Dealing with the differences between
3 the two systems and you say "Foothills does not
4 propose the construction of permanent airstrip
5 facilities in the Northwest Territories but would
6 instead rely on helicopter transport along the right
7 of way, and helicopter transport supplemented by fixed
8 wing aircraft operating from lakes or winter
9 airstrips for transport between the working areas and
10 existing commercial airports." Have you found that
11 passage 'sir.

12 What I was interested in,
13 is whether or not in deciding to opt for use of
14 helicopters and fixed wing aircraft, that will operate
15 on the lakes at some times of the year, Foothills has
16 had any advice from its environmental consultants as
17 to whether they consider it's more damaging to wildlife
18 particularly, birds, to have this type of aircraft
19 movement as opposed to using permanent airstrips?

20 WITNESS MIROSH:

21 A We have had input from our
22 environmental people as to level limitations for flight
23 over right-of-way . but obviously when these aircraft
24 must land, the environmental people allow us to do that.

25 Q Have they given you a
26 recommendation as to whether they would prefer that you
27 use permanent airstrips as opposed to helipads and
28 float equipped aircraft?

29 A No sir, they did not impose
30 any transportation requirements on us. They observed and

1 commented on what we were proposing.

2 Q Well was this question ever
3 referred to them for their specific advice and recommen-
4 dation?

5 A As to which would be a
6 preferable aircraft?

7 Q Yes.

8 A No sir.

9 Q As to which would be the
10 preferable method, that is using a permanent airstrip
11 as opposed to the Foothills plan which would see the
12 use of helicopter transport and float equipped airplane.

13 A Well they certainly endorsed
14 the fact that we wouldn't build large airstrips.

15 Q Sir on the second page of
16 your evidence, you spoke of a third area of difference
17 and that was the use, proposed use of refrigeration
18 during the first year of operation by Foothills, which
19 is not contemplated by Arctic Gas. In those stations,
20 as I understood it where there would be no compression,
21 Foothills would intend to install some chilling
22 facilities so that they could chill the gas passing through
23 those stations?

24 A Yes sir.

25 Q Arctic Gas would not
26 propose to chill in those circumstances, and their
27 chilling would only commence when the whole station
28 came into operation?

29 A Correct.

30 Q And the Commissioner asked

1 you a question about that. It's correct, is it not sir
2 that the difference in approach with respect to this
3 aspect of the design is based upon a difference in through-
4 put. That is, there is intended to be substantially less
5 gas going through the Foothills line during this
6 first year of operation than there would be going
7 through the Arctic Gas line during the same first year
8 of operation?

9 A Yes that's true, but the
10 Arctic Gas line is larger so the Joule-Thompson effects
11 would probably be lesser.

12 THE COMMISSIONER. Well maybe
13 we'll stop and have coffee now.

14 (PROCEEDINGS ADJOURNED)
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1
2 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)
3

4 MR. GIBBS: Mr. Commissioner,
5 Mr. Lazerte instructs me that on further reflection, he
6 has concluded that one of his answers to Mr. Marshall
7 was not accurate. He would like to expand on it, if he
8 may.

9 WITNESS LAZERTE:

10 A Mr. Marshall, I apologize.
11 I told you that there was no dove-tailing. I now recalled
12 during the coffee break that I did give a manpower build-
13 up to the pipeline people, and I do think that there is
14 an inter-relation now and a dove-tailing of that manpower.
15 I apologize for the oversight.

16 MR. MARSHALL:

17 Q Well perhaps if that's
18 been reduced to writing, we could have a copy of that.

19 MR. GIBBS: Well sir, I think
20 it was handed to Mr. Bauer, who will be on the construct-
21 ion panel. He can speak to it then.

22 MR. MARSHALL:

23 Q Mr. Mirosh, just to get
24 back for a minute to the size of the pads, we talked
25 about looping -- I'm sorry, I perhaps wasn't paying
26 close enough attention. Exhibit 246 does not show the
27 area for future expansion that Mr. Lazerte referred to,
28 and I gathered from the testimony that it's some area to
29 the south, and it's proposed that that area would be
30 used in the event there was a looping program carried

1 out. Do I understand that correctly?

2 WITNESS MIROSH:

3 A Correct.

4 Q What I wasn't sure about
5 is whether or not that additional area of pad would be
6 developed at the same time that the eleven acre pad would
7 be developed?

8 A No sir.

9 Q So that it would follow,
10 would it, in the event a looping program were undertaken,
11 that there would have to be an extension made to the pad
12 at that later date, whatever it was?

13 A Yes, sir.

14 Q Has Foothills got any
15 advice from its environmental consultants as to the
16 effects that there might be, the environmental effects,
17 if there were to be a reopening of borrow pits and
18 access roads and that sort of thing?

19 A No.

20 Q So you don't know whether
21 or not there would be an environmental advantage to
22 developing the whole pad, 11 acres plus the potential
23 future expansion area at the same time, rather than
24 having to do it in two stages?

25 A No sir, we really don't
26 know if we will need looping at this time.

27 Q Sir, turning to page 4
28 of your prepared evidence and the answer to question 5,
29 you talk about a maintenance information system. My
30 information, sir, is that this type of a system is pretty

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Marshall

1 well a standard practice in the industry. We're not talk-
2 ing about something that is novel in terms of Foothills'
3 proposal, this is something that there is some history to,
4 it's been done by other pipeline companies?

5 A Not that I'm aware to the
6 extent that we're describing. It's standard, perhaps in
7 the aircraft industry, but not necessarily in the pipeline
8 industry.

9 Q It's not being done by
10 Alberta Gas Trunk Lines?

11 A It's being developed.

12 Q Just a small point, Mr.
13 Mirosh. I was following along the prepared evidence on
14 the fifth page, and it seemed to me that when you read
15 it into the record, you deleted the last word, which was
16 the word "significantly". Was that just an oversight or
17 have you changed your views as to preventative mainten-
18 ance?

19 THE COMMISSIONER: Where is
20 that again?

21 MR. MARSHALL: Page 5, the
22 last page in the panel's evidence that was presented by
23 Mr. Mirosh. I just noted the last word had been left
24 out in his evidence.

25 Q I was wondering whether
26 that was just an oversight or whether there had been a
27 change in his thinking on this point.

28 A No, I dropped the word
29 "significantly".

30 Q Is there some reason for

1 this? Have you got new information that leads you to
2 change your assessment of the preventative maintenance
3 visits that would be required at the station?

4 A No sir, when I developed
5 this material before I inserted the word, and after
6 reflecting on it, I thought I would delete it.

7 Q That's fine. I'm not
8 quarreling with it, I just wanted to know what you had
9 intended.

10 THE COMMISSIONER: No, these
11 are shades of opinion, and reduced means reduced.

12 MR. MARSHALL:

13 Q Mr. Lazerte, do you intend
14 to anchor the compressors and chillers at the compressor
15 stations?

16 WITNESS LAZERTE:

17 A To anchor?

18 Q Yes?

19 A Could I just ask a further
20 question? Are you talking about separate and apart from
21 their foundations?

22 Q Well I understand, and I'm
23 not an expert in this by any means, as . will soon
24 become apparent, but when you have these large gas tur-
25 bines operating compressors, that there's tremendous
26 . forces generated on the compressors, and on the pipelines
27 that are exiting from the compressors. As a result of
28 the turbine, the action of the turbines, quite consider-
29 able force is generated on the pipe.

30 A The foundation designs

1 will reflect the forces that you're mentioning. The
2 foundation designs, of course, will not be done until
3 the final design stage.

4 Q Well in getting things to
5 the stage they are at today, in your presentation, have
6 you had the benefit of a stress analysis, to take into
7 account some of these stresses that will have to be
8 dealt with in the design of the station layout?

9 A No, we discussed this in
10 detail and decided it was not necessary to do this at
11 this time. However, I did discuss this particular point
12 with our stress analysis expert, Mr. Shin Tsutsumi, and
13 he agreed with me that this would not be a problem with
14 this particular configuration and design.

15 Q Well specifically, did
16 you consider the loadings that you would have, the
17 -- in the area, I see on your diagram, Exhibit 246,
18 between number 16 and number 13, you have a gas and pro-
19 pane compressor building, which is number 16, and number
20 13 is the chiller building.

21 A Yes, I follow you.

22 Q What about the thermally
23 induced stresses in the pipe between those two buildings?

24 Have you analyzed that at all?

25 A No we won't do that until
26 the final design.

27 Q The reason I raise it
28 is that my advisors indicate that there may be consider-
29 able difficulty in designing to take those thermally
30 induced stresses into account, given the layout that you

1 have here, and that you may need a considerably greater
2 space to be able to accommodate the configuration of pipe
3 that you are going to have to have between those two
4 buildings. Have you got that to the point of considering
5 that yet?

6 A No, we won't do that as I
7 stated. This is a general configuration only, that line
8 shown running straight between there may not necessarily
9 do that. We'll handle that later.

10 Q I see. Mr. Beer, you were
11 going through your slides and your direct evidence, and
12 in the course of a response to Mr. Justice Berger, you
13 mentioned that you hoped to be able to attain the noise
14 level attenuation that you have laid out in your evidence.
15 As I understand it, your objective is 60 dBA at the bound-
16 ary of the station?

17 WITNESS BEER:

18 A Approximately, yes.

19 Q Now, do I correctly con-
20 clude that it is, at this point in time, an objective,
21 or do you have a design which has satisfied you that you
22 will be able to achieve that degree of attenuation?

23 A The information that we
24 have, for example, from gas turbine compressor manufact-
25 urers, indicates that that is a realistic figure to
26 obtain.

27 Q Have you given any con-
28 sideration to the noise produced by the fans?

29 A Yes, we have.

30 Q And are you satisfied, on

1 the basis of the information you have got on their noise
2 producing characteristics, that you will still be able to
3 achieve that degree of sound attenuation?

4 A We believe that it's
5 possible.

6 Q Specifically, what sort
7 of data do you have? I don't want to go into great
8 detail with you here, but if you have some concrete
9 information from the manufacturers of the equipment or
10 whatever, my advisors would like to review that.

11 A We do not have any data,
12 specific hard data from the manufacturers of such cooling
13 or condensing equipment.

14 Q What do you have then, sir?

15 A WE have a, shall I say,
16 general experience level. We have done some preliminary
17 noise surveys at stations, or at plants in Alberta that
18 operate fans which are very similar to this, to what we
19 are proposing here for the condensers, and it isn't really
20 in the form of any really rigorous data, but it indicates
21 that we should have no problem in meeting these object-
22 ives.

23

24

25

26

27

28

29

30

1 Q I'm sure you would be the
2 first to agree with me that there aren't stations in
3 Alberta that are identical to the type Foothills is
4 proposing?

5 A Indeed I agree, and I did
6 correct myself and say plants which are operating
7 fans of a similar type of design. They're not identical.

8 Q Right, but they wouldn't have
9 the numbers of fans that you'd be proposing to have?

10 A Not the exact number, no.
11 As I say, it's a general indication, it's not a specific
12 and hard conclusion.

13 Q Are there any reports that
14 contain the results of your assessment of this?

15 A No reports as such, no.

16 Q It's all in your head, is it?

17 A And on the backs of
18 envelopes.

19 Q I see.

20 WITNESS LAZERTE:

21 A Just to clarify this
22 point and so that we don't mislead you again, we did
23 a two detailed sound surveys, one at an existing
24 Alberta Gas Trunk Line station, with as close to operating
25 horsepower as we will have in the Arctic. We took
26 measurements around the building, around the gas
27 turbine, station fence line, quarter of a mile from the
28 station. We then in order to get sound data on this
29 condensing types, we picked a plant with as close to the
30 configuration as we will be experiencing here, and went

1 out and took that sound data, and that then was reported,
2 the results of this were reported in an internal memo
3 within Foothills. That is the extent of the reporting.

4 Q Perhaps we could have a look
5 at that Mr. Gibbs?

6 MR. GIBBS: Again, I would want
7 to see the memo first before I give that undertaking, sir.

8 MR. MARSHALL: Naturally.

9 MR. GIBBS: Some of these matters
10 there is involved manufacturers propriety information
11 and I don't know whether that's contained in here or not.

12 MR. MARSHALL: You'll let me
13 know.

14 MR. GIBBS: If there is nothing
15 of that nature I see no reason why we shouldn't produce
16 it.

17 MR. MARSHALL:

18 Q Similarly, Mr. Beer, you've
19 given some noise level estimates that would result
20 when the stations were being blown down and I was
21 wondering what sort of data you had that supported the
22 estimates set out in your evidence?

23 WITNESS BEER:

24 A I have had access to a report
25 that was presented by a member of the Trans Canada
26 Pipeline Company, to the Canadian Gas Association a
27 few years ago which indicates some success in attaining
28 a noise level in the region of what we're discussing
29 here, for emergency station blowdowns.

30 Q Is that the paper that's

1 item number four in your list of support material,
2 a paper by Mr. Lancey, noise abatement at compressor stations.

3 A Yes indeed.

4 Q I see.

5 MR. MARSHALL: I just have a
6 couple of very minor points, I'm sure Mr. Scott will
7 say you're nitpicking, but just to make the record
8 clear, --

9 THE COMMISSIONER: He wouldn't
10 say that until he'd heard the points.

11 MR. MARSHALL:

12 Q Page 24 in answer to
13 question 18, it's quite a long one, the fifth
14 paragraph, you're talking about stack concentrations of
15 SO₂ in the order of two parts per million. My
16 advisors have checked and they tell me that that probably
17 should be four parts per million.

18 A With a concentration of
19 ten grains per 100 cubic feet?

20 Q Yes.

21 A Well I'm advised that ten
22 grains will produce two parts per million.

23 Q We have a difference of
24 opinion I guess.

25 And page 25, you're dealing
26 with the gas turbine exhaust, and the water vapour content.
27 I was wondering if you were basing that on an RB211
28 or what type of equipment?

29 A Well I'm basing it on an
30 aircraft derivative unit which we're considering for

1 our application and yes, the RB2-11 is one of those
2 units.,

3 Q Well again I'm told and it's
4 not perhaps terribly significant, point, that the figure
5 for an RB2-11 if that's what you're using is 4.8 percent
6 water vapour, not three to three and a half.

7 A Well those figures that have
8 been quoted, by manufacturers. I'm not in a position to
9 comment on that.

10 MR. MARSHALL: Those are all
11 the questions I have sir.

12 THE COMMISSIONER: Thank you, Mr.
13 Marshall. Mr. Bayly?

14 CROSS-EXAMINATION BY MR. BAYLY:

15 Q If I may begin again, Mr.
16 Mirosh, the compressor station sites according to your
17 evidence, both today and in your facilities location
18 evidence, have been chosen although you've given evidence
19 that they can be shifted short distances.

20 WITNESS MIROSH:

21 A Yes.

22 Q But you have also told us
23 today that you're uncertain about the sources of the
24 water that you will require, for the compressor stations
25 sites, is that correct?

26 A Yes that was in Mr.
27 Lazerte's testimony.

28 Q All right, and if Mr.
29 Lazerte would prefer to answer these questions himself,
30 rather than through you, I'd be happy with that.

1 Now, Mr. Lazerte, I gather the
2 water requirements you have given us are only for
3 the compressor station requirements, not the construction
4 camp on the compressor station site requirements, is that
5 fair to say?

6 WITNESS LAZERTE:

7 A Correct.

8 Q And would it also be fair
9 to say that you have not determined the amount of water
10 required on those sites or the sources while those are
11 being used as construction camps rather than compressor
12 station sites?

13 A I personally did not
14 work in that area. I can't speak to what the
15 construction people did.

16 Q You don't know then whether
17 those water sources may or may not have been determined?

18 A You're correct.

19 Q And I take it you're
20 aware that in order to use water for the purposes of the
21 compressor station sites, you will have to make appli-
22 cation under the Northern Inland Waters Act?

23 A We will comply with all
24 the regulations.

25 Q Well what happens now that
26 you've chosen your sites, if you are not given a permit
27 to take water from a place where you'd like to take it
28 to fulfill your requirements. Would you have to move
29 the compressor station?

30 A No. As stated here, there

1 are several sources, and if the eventuality occurred,
2 that you're suggesting and a permit was not available ,
3 I assume you're talking about a permit would not be
4 obtained to take it from a lake or a pond or a stream or
5 a river?

6 Q This is what I would
7 anticipate as a possible problem. yes.

8 A Possibly then we would
9 explore drilling a well, and if that alternate failed,
10 we would look at possibly trucking as one other
11 option.

12 Q All right, can you tell
13 me how you would truck water in with a helicopter?

14 A I suppose -- I haven't
15 -- I'm not really equipped to answer that question. I
16 should have used the word transport but perhaps it's
17 possible, I don't know.

18 Q All right, but you do see
19 that as a possible thing you might have to do is bring
20 water in by some sort of a vehicle?

21 A That could be a possibility.
22 We hope not.

23 Q All right, now you have
24 given us a figure of 10 000 barrels and I did a little
25 checking around with the people of a more scientific
26 bent and -- sorry, 1,000 barrels. is barrel the
27 same as a barrel of oil. Is it 42 gallons or do you
28 refer to some other --

29 A No, this is Canada, this
30 is a 35 gallon barrel please.

1 Q All right, so what we're
2 looking at is 35,000 gallons.

3 THE COMMISSIONER: This is a
4 Foothills witness, remember.

5 A I quit working with the
6 42 gallon barrel last November.

7 Q I see, a 35 gallon barrel
8 is what you were referring to though?

9 A That's correct.

10 Q So I take it that for the
11 running of your compressor stations, that the amount of
12 35,000 gallons would be sufficient for the number of men,
13 that's the maximum of 28 men for a ten day period?

14 A That figure I believe is
15 in here.

16 Q Yes, you've referred to
17 that. Located at page 11, question 10, where you talk
18 about 1,000 barrel storage tanks, with a capacity that
19 would last for ten days. Now I take it that's for the
20 use of the men, that is for washing, cooking, flushing
21 toilets, et cetera?

22 A Correct.

23 Q All right. what sort of
24 water requirements will you face for fire prevention or
25 have you looked into that?

26 A None.

27 Q You won't require any?

28 A It's not planned.

29 Q Now have you looked into the
30 fire prevention regulations in the Northwest Territories

1 to see whether you have to comply with any of them for
2 water requirements for a camp of this nature?

3 A No.

4 Q Do you plan to do that?

5 A Certainly we will have to
6 comply with those regulations

7 WITNESS MIROSH:

8 Well, are you referring.
9 if I may ask a question, about construction camps or
10 compressor stations after operation?

11 MR. MARSHALL:

12 I'm referring to both
13 because you may be faced with fire regulations in both,
14 which may be different, but perhaps Mr. Mirosh, you have
15 some information about compliance with fire regulations
16 on these sites, that is with regard to the amount of
17 water you will require during the construction period.

18 WITNESS MIROSH:

19 A Yes, I don't know the
20 figures but this would be in our construction camp
21 requirements. As to the compressor station, I believe
22 I'll leave that to Mr. Lazerte to continue the
23 discussion.
24
25
26
27
28
29
30

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Bayly.

1 Q He doesn't want to
2 take you completely off the hook, Mr. Lazerte.

3 Now if we can move on from
4 water to the question of sewage, and referring to Exhibit
5 -- actually before I do that, can you tell me, Mr.
6 Lazerte, about the state of the art on the drilling of
7 wells in permafrost for the extraction of drinking water
8 or water for washing?

9 WITNESS LAZERTE:

10 A No.

11 Q Do you know whether that
12 can be done, or is it just something on which you have
13 no information?

14 A Back when we started on
15 this, I questioned John Ellwood he contacted the Water
16 Resources people in Yellowknife or Inuvik. He brought
17 me back the rather general comment that drilled wells
18 were a possibility in the Territories, that generally the
19 experience was the water quality was not very good.
20 I let it go at that.

21 Q So you don't know whether
22 he was referring to drilled wells where the permafrost
23 is discontinuous or above that line?

24 A I had asked the question
25 about the permafrost areas.

26 Q And he came back with that
27 general answer, which hasn't been gone into any farther
28 by you in any event?

29 A Correct.
30

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Bayly

1 WITNESS MIROSH:

2 A Perhaps I could add a
3 point there. The delta camp of Alyeska does have a
4 drilled water supply, a well for water supply. I assume
5 from -- I should say that I assume that that is in a
6 permafrost area, since it is in the Fairbanks region.
7 That, I think is their only source of water for that
8 camp.

9 MR. BAYLY: All right.

10 THE COMMISSIONER: I think I
11 was at that camp. You said that that was their only
12 source of water so far as you know?

13 A Well I believe it is. I
14 recall touring the camp and being taken into the building
15 which houses several large water tanks for storage, and
16 next door a pump and casing for a well.

17
18 MR. BAYLY:

19 Q If we can move on, Mr.
20 Lazerte, to the question of sewage disposal. I'm looking
21 at Exhibit 247, the one that was handed out to everybody,
22 and number 14 on that exhibit is your sewage lagoon.
23 I'm wondering, with regard to the distance of that sewage
24 lagoon from the various buildings on the compressor
25 station site, whether you had looked into the regulations
26 under the Public Health Ordinance to find out whether
27 that was an appropriate distance from the buildings at
28 this compressor station site?

29 WITNESS LAZERTE:

30 A No.

Mirosh, Lazerte, Beer
Cr. Exam. by MR. Bayly

1 Q And do you plan to do
2 that?

3 A Certainly.

4 Q And if it turned out that
5 the distance that that sewage lagoon was from the build-
6 ings was too close, might it be necessary to move it off
7 the site entirely?

8 A I guess I have got a
9 problem then, if that occurs.

10 Q And I made an attempt to
11 look into the distance and I wasn't able to find out this
12 morning, just what that appropriate distance is.

13
14 A The distance shown on here
15 certainly would create no problems in Alberta, and I just
16 throw that in as a general comment, because this is the
17 area that I'm experienced in.

18 Q Yes. Would that have a
19 fence around it?

20 A The drawing shows the
21 outline of the fence. Are you asking about a separate
22 fence around the lagoon?

23 Q Yes.

24 A No decision on that.

25 Q All right, and if that
26 were something which was regulated under the Public
27 Health Ordinance, I take it you would comply with that
28 as well?

29 A Correct.

30 Q Now, I have information

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Bayly

1 that in some areas of Alaska, the principle of lagooning
2 for disposal of sewage, has been found to be not appro-
3 priate and has not been permitted, and is that why you
4 refer to your package treatment, in the event that that
5 should happen in various areas where you plan to put
6 compressor stations?

7 A That's correct. I made a
8 comment following my presentation. Internally, in Foot-
9 hills, this isn't fully resolved. I have some ideas
10 here, the -- Leo Bouckhout has some other ideas.
11 Naturally, we have to interface these and come up with a
12 satisfactory solution. I didn't want to present this as
13 the final plan, it isn't that at all.

14 Q Now, will this be pre-
15 sented, perhaps Mr. Gibbs can answer this, Mr. Commiss-
16 ioner, will this be presented at a later time in these
17 hearings, or is this something that Foothills plans to
18 leave until after regulatory approval?

19 MR. GIBBS: I can't answer
20 that, I haven't talked to Mr. Bouckhout about evidence
21 in the later hearings, I just don't know.

22 MR. BAYLY: All right, perhaps
23 we could get some sort of indication after Mr. Gibbs has
24 had the opportunity to discuss it with his people.

25 THE COMMISSIONER: I should
26 think it likely that Mr. Lazerte and Mr. Bouckhout would
27 both be giving evidence in the combined phases 2 and 3,
28 and the matter could be raised then.

29 MR. BAYLY: Yes, I would hope
30 so, and I think that's what has been done with Arctic

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Bayly

1 Gas' evidence in the same area.

2 Q Now, in referring to your
3 lagoons, Mr. Lazerte, you described a five foot deep
4 pond for the purpose of lagooning, and my information is
5 that five feet deep may be sufficient for an aerobic pond,
6 but an anerobic pond should be considerably deeper than
7 that. Would that be fair to say?

8 THE COMMISSIONER: Excuse me,
9 what kind of a pond?

10 MR. BAYLY: An anerobic pond,
11 a-n-e-r-o-b-i-c.

12 THE COMMISSIONER: Yes, I'm
13 sure I've been told what that means, but would you tell
14 me again?

15 MR. BAYLY: Well, my expertise
16 is getting close to its outer limits, and perhaps we
17 could ask the witness if he can give us a better explan-
18 ation than I could of that.

19 WITNESS LAZERTE:

20 A I certainly can't.

21 MR. BAYLY:

22 Q Apparently a certain amount
23 of oxygen has to be allowed to interact with the sewage
24 in the water, and this happens in two stages; one in a
25 shallow pond and one in a deeper pond. That is my
26 information, and as I say, my expertise doesn't go any
27 farther than that in this area. I'm just wondering if
28 that has been considered, I'm assuming it hasn't, Mr.
29 Lazerte.

30 A No, as I indicated before,

1 our plans are not firm in this regard, and much work
2 remains in this area.

3 MR. BAYLY: All right.

4 MR. MARSHALL: Mr. Bayly,
5 if it helps, I'm told that aerobic means decomposition
6 with air, and anerobic is decomposition without air.

7 MR. BAYLY: Thank you, Mr.
8 Marshall. You have the ear of science, I see.

9 MR. MARSHALL: It certainly
10 didn't come from my own storehouse of knowledge.

11 MR. BAYLY:

12 Q Now, I wonder, Mr. Lazerte,
13 if any input into your plans for disposal of both human
14 and other wastes has been made in conjunction with any
15 recommendations from the Department of the Environment,
16 with regard to the proper set-up of the various facilities
17 in this line for permanent camps?

18 A No.

19 Q Do you plan to be contact-
20 ing them before you go much farther in your design of
21 the various facilities?

22 A Yes. As I indicated
23 earlier, John Ellwood had some interfacing with the
24 Department up here, but I'm not sure which department
25 and which personnel he discussed these matters with.

26 Q All right, I understand
27 there is a Mr. Grange who has written a report on this
28 for the Department of the Environment, and that may be
29 of some assistance to you.

30 Now --

1 THE COMMISSIONER: Well that
2 report, I take it, is in the hands of Commission counsel?

3 MR. SCOTT: Yes, it is.

4 MR. BAYLY:

5 Q Now, if we can go on,
6 gentlemen, to the question of manned as opposed to un-
7 manned compressor stations, and this was a line of
8 questioning that I explored with the Arctic Gas witnesses.
9 My understanding was that for various reasons, unmanned
10 compressor stations had been employed on the Trans-Canada
11 line at an early stage, they were then, because of
12 certain equipment problems, -- they then became manned
13 compressor stations. Is it your understanding that it's
14 now possible to have unmanned facilities without running
15 into the problems that Trans-Canada Pipeline ran into?

16 WITNESS MIROSH:

17 A Yes sir. We are, I guess
18 we have followed what Trans-Canada has been doing in a
19 general sense over the last few years, but we are more
20 familiar with the Alberta Gas Trunk Line system, which
21 does, in fact, operate nearly every one of their compressor
22 stations unmanned.

23 Q And you believe that that
24 will be satisfactory in the areas that you propose to
25 put compressor stations in the Mackenzie Valley?

26 A Yes, it certainly will be.

27 Q If it isn't satisfactory,
28 would you be able to man them --

29 A Yes.

30 Q -- given the facilities

1 you have?

2 A Yes.

3 Q And that includes your
4 transportation facilities?

5 A Well, I should point out
6 that the stations obviously, or perhaps not so obviously,
7 but they would be manned of necessity during the first
8 few years of operation, during the start-up debugging
9 phase, and subsequent to that, the manpower will be
10 reduced by eliminating shifts, to a point where what we
11 refer to --

12 THE COMMISSIONER: Eliminating
13 what?

14 A Eliminating shifts.

15 THE COMMISSIONER: Shifts?

16 A Yes, shifts; to the point
17 where ultimately, the manning level of the stations
18 would either be a day shift or if we feel that we can
19 eliminate that at some stations they would be totally
20 unmanned for all shifts. But unmanned to us would mean
21 that there are periods of time when that station can
22 operate without a man, which in Alberta for many stations
23 would be during the evening shift and the night shift.

24 MR. BAYLY:

25 Q All right, so if local
26 people were seeking jobs in compressor stations, they
27 could expect those jobs to last for a few years and then
28 be phased out, would that be fair to say?

29 A No sir, because the
30 stations will require continual maintenance. The

1 maintenance forces will be required perhaps on a daily
2 basis during some intermediate stage when the stations
3 are being unmanned; perhaps on a less frequent basis
4 after that, and there will probably be a shifting of
5 personnel who operate stations and maintain them during
6 the start-up phase into the district offices, where they
7 would then be still doing the same function, but from a
8 different home base.

9 Q All right, so you would
10 be bringing them -- you would have approximately the same
11 number of people at a central location that you would
12 ship into the various compressor stations when maintenance
13 was required?

14 A Could you repeat that
15 one, please?

16 Q Well from your answer, I
17 would take it that you would not reduce the number of
18 personnel, you would just reduce the number of personnel
19 at the compressor sites until it arrived at zero, and
20 those personnel would be kept in central, more central
21 locations, towns, villages, whatever, and would be taken
22 out to do the maintenance when required?

23

24

25

26

27

28

29

30

1 A That would be a general
2 rule. There would be some phasing out of start up
3 people who would be from Calgary, let's say, who would
4 be involved in the first start up of stations. They
5 would then leave after start up is over but the locally,
6 in the North, there would be a shifting of people from
7 the stations to the communities.

8 Q Now, you've referred to
9 maintenance people not being required for anticipated
10 break down and problems in the compressor station.
11 What's the difference between anticipated and unantici-
12 pated?

13 A Well, if one can predict
14 when something is failing at a station, and it hasn't
15 failed yet, then one can perhaps reduce the power level
16 that the station is running at, and continue throughput
17 at a lower power level so that the parts are not being
18 stressed and then plan to shut that station down perhaps
19 the next day or the day after, in other words, that
20 would be a planned shutdown based on information.

21 Q I'm sorry, you better
22 finish your answer and then I'll ask the next question.

23 A Yes, whereas an unplanned
24 shutdown would be one where a local device would merely
25 shut the station down, generally unannounced to anyone,
26 until it was shut down.

27 Q All right, given the kind
28 of flying conditions that sometimes occur in the Mackenzie
29 Vally, do you anticipate problems of getting people in
30 and out, in the time length that you would anticipate

Mirosh, Lazerte, Beer
Cross-Exam by Bayly

1 having to get in to do the various repairs should they
2 come up according to your alarm system?

3 A Yes, there will be a
4 certain number of days which are probably zero visibility
5 days, these are a small number from what I recall, but
6 that's one reason why it's important to have such a
7 system as a preventative or predicted maintenance
8 system.

9 Q You don't see the
10 problem as being very great of having the weather out
11 for a significantly long period of time, three, four
12 days for example?

13 A Well, there are other
14 ways of getting to stations if one had to, in the
15 wintertime, of course, there is overland access and
16 perhaps into a great number of stations, this would
17 be possible during any part of the year, without taking
18 into account environmental damage. So that, this coupled,
19 with the planned maintenance and remote control that
20 we are anticipating should not present a great problem.

21 Q All right, now you've
22 spoken of the possibility of damaging or doing things
23 to the environment by building airstrips. Have you
24 evaluated the cost environmentally of doing that as
25 opposed to the costs of having to go in over land if
26 you aren't able to go in by air?

27 A Well of course airstrips
28 need fly ing weather as well. So that having airstrips
29 would not necessarily allow us to get into locations
30 that we could not get into with helicopters. The other

1 thing is, I suppose if one went to airstrips, one might
2 want to place one at every compressor station, which
3 would be 17 sites.

4 Q All right, let's while
5 we're just on the subject of helicopters, while I was
6 listening to your evidence under cross-examination by
7 Mr. Marshall, I was trying to envisage a camp of three
8 or four hundred men being taken out from time to time
9 and/^{re}placed with another crew. And all this being done
10 by helicopter. Do you envisage this as being any
11 sort of a problem?

12 A Well there is a winter
13 road which is also or has been available over the last
14 few years and of course, our major construction is going
15 on in the wintertime, so this coupled with large
16 passenger helicopters, coupled with the possible use of
17 larger aircraft off frozen lakes or the use of existing
18 abandoned airstrips or existing airstrips that are in
19 the north that are functional during the wintertime,
20 we feel that we can get adequate coverage.

21 Q All right, can I take it
22 from that answer that you figure that/somehow you'll be
23 able to do it?

24 A Yes.

25 Q But you haven't determined
26 quite how?

27 A Well it would be a
28 combination of all/of these in the final analysis.

29 Q All right. Now, looking
30 again at Exhibit 247, and looking at your chiller, I

1 gather that gives off a lot of heat? I'm sorry, is that
2 246, the yellow one? Sorry, 246.

3 WITNESS LAZERTF:

4 A No the chiller doesn't
5 give off a lot of heat.

6 Q Where will your heat
7 come from to heat your buildings? Would you tap it
8 off the pipeline or have some other fuel supply?

9 A There's a building heating
10 system. It would be a circulating glycol water mix.

11 Q That would be supplied by
12 the line itself?

13 A No. The heat input to
14 the glycol water mix will come off -- right now we're
15 planning for that heat source to be the exhaust from
16 the electrical generator.

17 Q All right but the plant
18 itself will be able to heat the buildings in the com-
19 pressor station?

20 A Yes, and as I say, the
21 heat source will be the exhaust from the electrical
22 generators and in the event of their failure, I believe
23 we have an alternate boiler, gas fired boiler.

24 Q All right. What about
25 in the event of shut down, for some other reason? How
26 do you keep your buildings from freezing up? Say you
27 have a failure at a river crossing and you have to cut
28 off the entire line to repair it during the winter time.

29 A The standby fuel area
30 is that area 7.

1 Q So that will be fuel oil
2 tanks or something of that nature?

3 A Yes.

4 Q Now there are a large number
5 of buildings on this site and the dimensions are such
6 that I'm not sure whether those are trailer units or
7 units that would be constructed on site. Do you have any
8 plans of that nature?

9 A Yes they're in our sub-
10 mission to the N.E.B. in more detail than on this sketch,
11 Figure 3B 9.2 being a typical station one to 13 chilled.
12 It shows all the building sizes.

13 Q Now would those be trailer
14 units or would they be buildings built on site?

15 A They're permanent buildings.
16 Some of them, the smaller ones self framed, the others
17 steel frame structures.

18 Q All right, will they be
19 constructed on site or will they be prefabricated units
20 flown in?

21 A As much as possible, they'll
22 be pre-built. Now obviously when you get to the gas
23 compressor building and chiller building, those will
24 have to be constructed on site. ^{would} Again, we bring in
25 as big as a component as we could.

26 Q So anybody locally that
27 was in the building trade could not expect to be building
28 camp buildings for the compressor stations?
29 They would be brought in as much as possible?

30 A That's a difficult question

1 to answer now. We're getting in the area of the contactor,
2 how the contract is drawn. I don't think I could comment
3 in too much detail at this time about that.

4 Q Let me just ask you this.
5 From what you have said, it is your plan to bring in
6 as many pre-built units as possible, because of the
7 ease of that kind of construction or whatever the reason
8 may be?

9 A That's the correct way to
10 do it in the Arctic, yes.

11 Q Now, with regard to the
12 getting rid of solid wastes, you 've had some comments
13 on that in your evidence. Do you plan to incinerate
14 those on the site or would that be your preferred
15 course of action?

16 A Any that you can incinerate
17 and still meet regulations.

18 Q And what would you do with
19 the rest?

20 A I wonder if you could
21 define for me what waste you're talking about?

22 Q I was thinking of the
23 kinds of -- I don't mean sewage, I mean there's food
24 garbage for when people are there, and there will be
25 the kind of camp and construction garbage that occurs,
26 I expect during construction, but also during maintenance,
27 things get thrown away. Where do they go?

28 A Most of the articles that
29 you have discussed could be incinerated.

30 Q All right, and have you

1 thought of the kind of facility you would use to incin-
2 erate these?

3 A No details on that
4 incinerator at this time.

5 Q Now, I take it from one of
6 your earlier answers, that this black line on 246, on
7 the outside perimeter of the station is a fence?

8 A Correct.

9 Q And what sort of a fence
10 is that?

11 A We have no fence designed
12 but a general comment would be that it will be chain
13 link with four strand barbed wire typically, but no
14 fence design yet.

15 Q All right, and what are you
16 trying to keep out or in?

17 A This is just normal
18 practice. The first thing that comes to mind is
19 security. The second thing that would come to mind is
20 that we certainly don't want animals coming into a
21 station where they might get hurt.

22 Q Okay, now if the question
23 is one of security, it interests me because we heard evidence
24 yesterday that the company would not plan to use block
25 valves because of the isolation of the area and yet
26 the fence may be in partially for security. Can you
27 comment on that?

28 A Perhaps Mr. Mirosh, I
29 don't get the full thrust of that question.

30 WITNESS MIROSH:

1 A I didn't get the thrust
2 of it, could you rephrase it perhaps.

3 Q Yesterday you told us you
4 didn't need block valves.

5 A Yes.

6 Q And block valves are
7 valves you use down south, partially for security, but
8 here you've got a pipeline that you say is in an
9 isolated area, and therefore you don't need that kind
10 of security. However, one of the reasons for having
11 a chain link fence with four strands of barbed wire on
12 the top as a possible kind of fence, would be for security.

13 A Well block valves are
14 not used for security I think in the way that you're
15 defining it. There are two functions. One is a safety
16 aspect, in minimizing the amount of gas that could be
17 expelled from a line section, the other one would be to
18 assist in looping operations or repairs. So the two
19 don't seem to be connected in the sense that you put it.

20 Q Well as I understood the
21 evidence yesterday, Mr. Mirosh, the problem with
22 southern pipelines is that most of the breaks are caused
23 by third parties. Now if somebody breaks a pipeline,
24 then you use the block valve to turn off the gas .
25 Now if somebody breaks a pipeline, then you use the
26 block valve to turn off the gas. have I got that
27 right?

28 A Yes, there are block
29 valves at stations as well and one is shown on that
30 drawing.

1 Q Now you said that you
2 didn't want to put in any independent block valves,
3 apart from the ones at stations yesterday, is that
4 correct?

5 A Yes, we said we're not
6 proposing to do that.

7 Q That's because you don't
8 anticipate third parties breaking this pipeline, because
9 there won't be the kind of traffic you get down south
10 in pipeline areas?

11 A Yes.

12 Q To me that's a form of
13 security, correct me if you don't agree.

14 A Yes.

15 Q Now this fence is for
16 security as well?

17 A Yes.

18

19

20

21

22

23

24

25

26

27

28

29

30

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Bayly

1 Q I'm just wondering what
2 it's to secure from what?

3 A Well I guess it's two ways,
4 one is to -- or at least two, one is to secure that the
5 public are protected from going in and hurting themselves
6 in such a station, which could happen; the other is that
7 the pipeline company is protected from trespassers.

8 Q Now, one of the other
9 points that there is a possible reason for the fence is
10 for the protection of animals. Now, coupling this with
11 Mr. Beer's comments about birds being a nuisance in nest-
12 ing season if they are protecting the young inside the
13 compressor station, brings to mind the possibility that
14 on sites like this you are going to run into situations
15 where animals do come, and those animals may be such
16 things as bears, that may cause trouble both to the
17 facilities, and the people in them. Have you thought of
18 contingency plans, other than the fence to deal with
19 that sort of situation?

20 A To protect the facilities
21 against bears?

22 Q I'm thinking mainly of
23 the personnel, but --

24 A Well yes, there have been
25 thoughts along those lines, and not within the scope of
26 this panel, but personnel safety and means of defending
27 themselves against such animals, such as the control of
28 fire-arms or the use of fire-arms, if they are required
29 for personnel safety, will be dealt with by a future
30 panel.

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Bayly

1 Q Allright, and when you
2 were firming up your plans for the incineration of gar-
3 bage, will you be taking into account the problems that
4 you may encounter with animals such as bears or wolver-
5 ines or foxes and garbage, they being attracted by these
6 things to sites such as compressor stations?

7 A Yes, that will be taken
8 into account, especially now that you have mentioned it.

9 Q That's what I had rather
10 hoped.

11 Now, looking at question 8 on
12 page 9 of your prepared evidence, you refer in the third
13 paragraph, again on the subject of incinerators, that
14 the incinerator will handle emergency disposal of pipe-
15 line condensates that are not trucked, plus combustible
16 solid wastes. Now, I gather you don't under normal con-
17 ditions, plan to dispose of pipeline condensates by
18 using the incinerator?

19 WITNESS LAZERTE:

20 A There is an option there,
21 there's been no final decision as to which is the first
22 option. I would say that if it's possible to truck it,
23 move it that way, that might be the preferred method.

24 Q All right. And again,
25 could that be trucked out by helicopter to your knowledge?

26 A We haven't looked at that.

27 Q What sort of volumes are
28 we looking at?

29 A They should be very
30 small. What we are talking about here is condensates

1 that have entered the line in the vapour phase from one
2 of the processing plants. That's the only way it can
3 get in here. In other words, you have a disruption at
4 Taglu or Parsons Lake, of course we have detectors here,
5 shut-off equipment and this kind of thing, but human
6 beings being what they are, possibly a small amount of
7 Pentanes Plus might get through into that line.

8 Then, of course, you get below
9 the hydrocarbon dew point, get a little liquid in the
10 line, the volumes will be small, picked up in the inlet
11 scrubber and on into storage. It will be small.

12 Q All right. Now, while we
13 are on the question of substances, is it not true that
14 there are various kinds of substances used in the com-
15 pressor stations that if they were not handled properly,
16 might cause a great deal of environmental problem if
17 they were allowed to escape?

18 A Correct.

19 Q And what are your plans
20 with regard to such substances?

21 A Would you be more
22 specific?

23 Q All right, I understand
24 there is a liquid that is used, I believe it's as a
25 lubricant, that Mr. Anthony was questioning Arctic Gas
26 on at an earlier stage, and that this was a dangerous
27 substance and I wondered what plans were being taken to
28 ensure that this was not mishandled.

29 A I wonder if you could
30 tell me what the substance was? Which we are discussing?

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Bayly

1 Q I was hoping you could do
2 that for me. Now, if we can't do it that way, you have
3 acknowledged that there are certain dangerous substances.
4 Would you tell us what dangerous substances you plan to
5 use, and what plans you have made for their handling?

6 A I'm inferring here that
7 we are discussing a lube oil, or seal oil, possibly with
8 some additives, and from time to time, of course, these
9 oils will be changed, and I think this is what we are
10 getting at here.

11 Q Yes, what will be done
12 with these?

13 A If there is any chance
14 that incineration results in release of vapours that are
15 undesirable to the atmosphere, it will not be done that
16 way.

17 Q All right, but will tests
18 be done, or have tests been done to see whether this is
19 in fact the case?

20 A Well it's pretty hard at
21 this time because normally what you do is select your
22 major rotating equipment, and then when you are getting
23 your warranties, agree with that vendor the oil that
24 you are going to use in that machine, and until that
25 time and until he endorses that product, you can't say
26 what you are going to have in those systems.

27 Q Well let's assume that we
28 get to that stage, and you're bringing the substances
29 into the compressor station sites for the purpose of
30 lubricating the equipment, and you're removing them from

1 the equipment and changing them from time to time. Do
2 you plan to do tests on these various lubricants to make
3 sure that if they shouldn't be incinerated, that you
4 won't do it?

5 A As a normal, yes, the
6 answer would be yes. We would be testing the lube oils
7 and certainly that will be looked into.

8 Q All right, you can appre-
9 ciate that the problem is that somebody might put it into
10 the incinerator and that might be your test. That would
11 be the thing that I would want to avoid.

12 A We will avoid that.

13 THE COMMISSIONER: Well, does
14 that answer that?

15 MR. BAYLY: Those are all the
16 questions I have, sir. Thank you very much, gentlemen.

17 MR. BELL: No questions.

18 MR. SCOTT: Mr. Commissioner,
19 I could hardly resist observing that when Mr. Bayly
20 was explaining the difference between aerobic and anerobic,
21 one of my advisors in explaining it to me and referring
22 to the timetable of the inquiry said, this was an an-
23 erobic inquiry, one in which decomposition occurs without
24 air. So I understand the impact of the distinction.

25 THE COMMISSIONER: I think
26 that that man deserves a raise.

27 MR. SCOTT: I think that that
28 man deserves a holiday.
29
30

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Scott

1 CROSS-EXAMINATION BY MR. SCOTT:

2
3 Q Mr. Mirosh, one of the
4 items that you have dealt with in distinguishing your
5 application from Canadian Arctic Gas', is the absence of
6 air fields at compressor stations, and this is of concern
7 both to the operating phase of the project, and of course
8 to the construction phase. Leaving aside, for the moment,
9 my observation that there appears to be some conflict
10 between the statements made as to transportation modes
11 between this panel, the construction panel and the
12 operation and maintenance panel, let me see if I can ask
13 some specific questions that are related to the operat-
14 ing phase.

15 First of all, is it possible
16 to clarify how you propose to carry out supply and trans-
17 portation in and out of the compressor station sites?
18 First of all, are you going to use only helicopters?

19 WITNESS MIROSH:

20 A Well for those sites
21 where there are no other means available, that's what we
22 are proposing.

23 Q Well, do you know which
24 those sites are?

25 A Yes, I think we have a
26 handle on those.

27 Q Well can you now or later
28 provide to us, the sites at which only helicopter trans-
29 portation will be utilized?

30 A We can do that later.

1 Q Yes. I take it that
2 another mode is permanent roads?

3 A Permanent or temporary,
4 yes.

5 Q All right, well let's
6 take permanent first. Can you let us know those sites
7 where permanent roads will be used as the transportation
8 mode?

9 A Yes, I believe that's in
10 our application.

11 Q I see, and are permanent
12 roads in addition to or in place of helicopters?

13 A The helicopter pads would
14 be in addition to permanent roads.

15 Q Yes, so that where there
16 are permanent roads, there would be helicopter transport-
17 ation as well?

18 A Correct.

19 Q Yes, and I take it that
20 in some cases you will use non-permanent or snow roads?

21 A Yes, at the appropriate
22 times of the year.

23 Q Yes, and do you know what
24 sites you intend to rely in part or entirely on snow
25 roads?

26 A Well for construction,
27 you're talking about operations, of course?

28 Q Yes.

29 A I'm not certain I can
30 answer that right now.

1 Q Well, can you undertake
2 to provide an answer to us on that score?

3 A Certainly.

4 Q And I take it that in the
5 case of non-permanent or snow roads, do I understand that
6 Foothills will assume the responsibility for constructing
7 and maintaining these annually?

8 A If they are snow roads
9 which we deem we will build and require, yes.

10 If others build them, then
11 others would maintain them, I would suspect.

12 Q Well now what size and
13 type of helicopters do you intend to utilize in operat-
14 ions and maintenance?

15 A Well there would be a
16 spectrum of helicopters. Smaller units such as one
17 sees in the north a great deal would be used to trans-
18 port operations and/or maintenance personnel of small
19 numbers. There are larger helicopters which are commer-
20 cially available, and in service to carry upwards of 28
21 passengers and an appropriate configuration, or alter-
22 natively, a four ton load.

23 Q Well we are aware that
24 there is a variety of helicopters available. Arctic
25 Gas was able to give us with some precision, the heli-
26 copters that they intend -- or the aircraft that they
27 intended to use. Are you able to do the same?

28 A We haven't got a formal
29 report on this, but we do have catalogues and listings
30 of equipment available from people that rent machines

1 and people that sell machines, so we could offer this
2 to you.

3 Q Could you provide to us,
4 a list of the vehicles that you intend to use? You will
5 understand that there is some certain impact, bearing in
6 mind the kind of equipment that is utilized, and it would
7 be helpful in Phases 2 and 3, ^{to know} as we know in the case of
8 Arctic Gas, what you intend to utilize.

9 MR. GIBBS: Well sir, it would
10 be pretty difficult to be specific about something that
11 is going to occur four or five years' hence. Who knows
12 what equipment is going to be available, what it's
13 configurations are. It's sort of like the National
14 Energy Board asking us what kind of motor tires we are
15 going to use in 1984, it's just a very difficult thing
16 to produce for anybody at this time.

17 MR. SCOTT: Well, Mr. Comm-
18 issioner, the other applicant has been --

19 THE COMMISSIONER: Are those
20 the kind of questions they ask down there?

21 MR. GIBBS: One of the defi-
22 ciency questions was, what kind of automobile tires and
23 in what quantity and from what manufacturer are you
24 going to use?

25 MR. SCOTT: I don't propose
26 to ask that question, so Mr. Gibbs can rest easily on
27 that. I intend to ask a more significant one, about
28 which some knowledge surely can be anticipated at this
29 stage, particularly bearing in mind that helicopters
30 will be exclusively, in some instances, the mode of

1 transportation in and out. Its ramifications, it's not
2 asked for out of curiosity, its ramifications are related
3 to the evidence in Phase 2 and 3, and surely the appli-
4 cant's present estimate of what it intends to utilize,
5 is available.

6 THE COMMISSIONER: Well I think
7 you should do the best you can at any rate.
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1 A We do have equipment
2 specifications, of currently flying equipment of that
3 type, which we can offer you.

4 Q Well now, can you tell us
5 about -- dealing first of all with a compressor station
6 where the access will be by helicopter only, can you
7 tell us anything about the frequency of the flights?

8 Now Arctic Gas undertook, I'm
9 not sure that they've complied with their undertaking
10 in this regard yet, but they undertook to provide
11 similar information and I wonder if Foothills can do so
12 as well.

13 A Again, during the
14 operational phase is it?

15 Q Please.

A Well we don't have again a report which we can offer you, but during the early years of operation, I suspect flights could be very close to daily.

20 Q One a day, one in and
21 one out a day?

22 A This could be the case.
23 If the station is encountering problems in getting
24 started during the short period of start up phase.

25 Q Well then I will assume,
26 . until I hear to the contrary, that it is Foothills
27 position that at exclusive helicopter service compressor
28 stations, there will be one flight in a day and one
29 flight out a day?

30 MR. GIBBS: That's not what the

1 witness said sir, he said during the initial stage, it
2 may be necessary to make flights that frequently. He
3 didn't say they were going to do it all the time.

4 MR. SCOTT:

5 Q All right, how long do you
6 anticipate the initial stage will last, roughly?
7 A year or two years or what?

8 A Well if I can refer to
9 experience in Alberta which should be somewhat
10 transferrable, the commissioning stage for a compressor
11 station of somewhat simpler design, since chillers would
12 not be involved, could be as short a period as a few
13 days to as long a period as a couple of months, depending
14 on the problems one encounters and generally, this time
15 frame drops drastically after the first station is debugged
16 and the people doing that work have become accustomed
17 to it and can do it in a far more efficient manner for
18 subsequent station.

19 Q Well what do you anticipate
20 is the average commissioning stage for one of these
21 compressor stations? For the purpose of measuring the
22 frequency of helicopter flights in and out?

23 A Well I would be tempted to
24 double that estimate in view of the fact that there is
25 other equipment involved. If it's a chilling station
26 and a compressor station, we might multiply those by two
27 but again, this time period would diminish by some curve
28 after the people doing this work gain expertise.

29 Q Well when you multiply it
30 by two, what do you get?

1 A I would get perhaps
2 four weeks to perhaps three or four months, for the
3 first such station, diminishing down to some proportion
4 of that for the future stations.

5 Q All right. following
6 that, what do you anticipate with respect to the
7 frequency of helicopter flights on those stations where
8 they will be the single or principal mode of communication?
9 Of transportation?

10 A Well in view of the fact
11 that the isolated stations will have in fact living
12 quarters for maintenance and operations personnel,
13 these people could be living in these quarters, and
14 would not require access to the outside world for
15 periods of perhaps once a week for groceries and parts
16 and for transferring personnel out and in. So, on the
17 basis of that assessment, I would say perhaps a week.

18 Q Once a week in, once a
19 week out.

20 A Barring difficulties,
21 which are difficult to foresee right now.

22 Q Well now, we are also
23 concerned about transportation in and out to these
24 sites which are construction pads during construction,
25 is that a question we should refer to you or should we
26 reserve that for the construction panel?

27 A Well I think that would
28 be more appropriate in the other panel.

29 Q I note, I think I'm
30 correct, that there is no reference to it in the trans-

1 cription for the construction panel, but perhaps they
2 can amend their responses by including it.

3 MR. GIBBS: I wonder if my
4 friend would explain what he means by that, merely
5 because the construction panel doesn't refer to it in
6 the direct evidence doesn't mean to say you can't ask
7 about it.

8 MR SCOTT: No, I can certainly
9 ask it but obviously if their direct evidence is the arbit
10 of what they want to say, they may not be prepared to
11 deal with it if they're not given some warning.

12 MR. GIBBS: I hadn't noticed
13 the panels were expected only to talk about what was
14 in their prepared evidence.

15 MR. SCOTT:

16 Q Well now, are you in a
17 position to tell us anything about the -- with respect
18 to the sites, about the location of these landing
19 pads?

20 A Yes they're located on
21 one of the exhibits, which shows the compressor station
22 Plot Plan. Item Number 17.

23 Q I see.

24 Turning to water supply and
25 sewage, the panel has told us something about the
26 plans, tentative though they may be, with respect to
27 water and sewage, and I take it that what you have
28 described for us is the plans, being developed, for
29 the compressor stations in their operations and maintenance
30 phase, is that correct?

1 A Yes.

2 Q And I take it it's
3 perfectly obvious that the water and sewage requirements
4 at those same places during construction when there are
5 four or five hundred men will be entirely different in
6 scope? Without a loaves and fishes miracle, 28
7 gallons, whether it's 35 -- 28 barrels isn't going to
8 be an adequate water supply during construction.

9 A Of course there will be
10 plans for other water supply during construction.
11 I'm not certain on the lagoon and I would prefer to
12 leave that to the construction panel.

13 Q Well that's what I was
14 going to ask. I take it that we can now agree that we
15 will restrict ourselves to discussing water and sewage
16 in the operation and maintenance phase on the understanding
17 again though it's not referred to in the transcription,
18 that the construction panel will be able to deal with
19 those matters in the construction -- when it gives
20 evidence?

21 A Yes, I would hope they
22 would.

23 THE COMMISSIONER: How much
24 longer will you be, Mr. Scott.

25 MR. SCOTT: Half an hour.

26 THE COMMISSIONER: Well, we'll
27 adjourn for lunch then until two and I may be in a
28 position to say something at two about the cross delta
29 route.

30 Well we'll adjourn until two.

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

THE COMMISSIONER: I will call the hearing to order this afternoon. I have received a letter from the Honourable Judd Buchanan, Minister of Indian and Northern Affairs, dated September 15th, 1975, enclosing a copy of a letter to the Honourable Mr. Buchanan, dated August 15th, 1975 from Mr. L.G. Hurd of Canadian Arctic Gas Pipeline Limited.

The letter written by Mr. Hurd to the Honourable Mr. Buchanan says:

"Dear Mr. Minister:

"With this letter, Canadian Arctic Gas Pipeline Limited applicant, transmits to you for filing, two copies of a supplement to its application for authorization to use lands in Canada's northern territories filed March 21st, 1974. This supplement describes an alternative routing for portions of the supply lines and the northern end of the main line, in the region of the Mackenzie Delta in the Northwest Territories, and describes also the consequential changes to applicant's construction and operating plans and environmental impact.

"Changes to applicant's estimated costs and pro forma financial statements are provided also for

1 information. This alternative to appli-
2 cant's filing is submitted so that it may
3 be examined by the Department and its
4 Inquiry concurrently with examinations
5 of applicant's initial filing. It is
6 not intended at this stage that it be a
7 substitution for or amendment of appli-
8 cant's initial filing".

9 The Minister's letter, and the
10 copy of Mr. Hurd's letter that accompanied the Minister's
11 letter, will be marked as Exhibits. The letter from
12 the Minister indicates that the inquiry will be receiv-
13 ing -- and I thought it would be in the mail today, but
14 I have no doubt that it will be in the mail tomorrow
15 or the following day, the mails being what they are.
16 The material relates to Arctic Gas' evidence regarding
17 the suitability of the Cross Delta route for the Prud-
18 hoe Bay supply leg.

19 I would ask you, Mr. Marshall,
20 to provide to all of the participants, copies of the
21 material that Mr. Hurd sent to the Minister, if you
22 would.

23 MR. MARSHALL: Yes sir, I
24 checked into that and my understanding is that Mr.
25 Hurd was arranging for a number of copies to be sent
26 to Mr. Workman, and I'll follow up on that and see if
27 they have arrived in Yellowknife, and if they have,
28 we will get them distributed.

29 I believe that my friend, Mr.
30 Gibbs, has a copy already, do you not?

1 (LETTER DATED SEPTEMBER 15, 1975 MARKED EXHIBIT 249)

2 (LETTER DATED AUGUST 15, 1975 MARKED EXHIBIT 250)

3 MR. MARSHALL: We will get them
4 to everybody.

5 THE COMMISSIONER: Yes, as long
6 as we have your undertaking that you will supply copies
7 of all of the material referred to in Mr. Hurd's letter
8 to the Minister to all participants.

9 That's fine. Now, I want to
10 consider the evidence relating to the Cross Delta route
11 when the Inquiry is in Inuvik. Can you tell me whether
12 you think that that evidence will be ready for present-
13 ation early in the new year? Are you in a position to
14 indicate whether it will be or not?

15 MR. MARSHALL: I believe it
16 will, sir. I will check further and if that's not going
17 to be possible, we will let you know, but on the basis
18 of the inquiries I have made to this point, I think we
19 will be able to do that early in the New Year, and
20 perhaps sooner if it should develop that the Inquiry
21 finishes consideration of Phases 2 and 3.

22 I will have to get some more
23 specific information, though, sir, and I will let you
24 know.

25 THE COMMISSIONER: Well, it
26 appears that we will finish Phases 2 and 3, according
27 to Mr. Scott in December. What I would like to do is
28 to convene the Inquiry in Inuvik in January, and to
29 consider there the evidence relating to the Cross Delta
30 route, and after it has been heard, in Inuvik, the

1 community hearings could take place in the delta commu-
2 nities, and we would, I hope, be able to hold those
3 hearings in Inuvik and in the other delta communities
4 in January and February.

5 MR. MARSHALL: I don't think
6 that should --

7 THE COMMISSIONER: At any rate,
8 we can --

9 MR. MARSHALL: -- present
10 problems, sir, as we had indicated earlier there was
11 some question as to when the environmental studies
12 would be completed and the results in a form that would
13 be useful to the inquiry. I will check that again with
14 Mr. Hemstock. I believe from an earlier conversation
15 with him that there should be no difficulty in meeting
16 this sort of a time frame, but I will confirm this
17 more explicitly as soon as I can.

18 THE COMMISSIONER: Well at any
19 rate, I simply want to make it clear that so far as it
20 is practicable, I would like evidence that relates to
21 the impact of the proposed gas pipeline and the route
22 across the delta, as well as other evidence relating
23 to the impact of the gas plants, and the gathering lines
24 on the delta to be heard at Inuvik, and to be heard
25 before we hold community hearings in the delta
26 communities.

27 It seems to me that's a logical
28 way of proceeding, and I'm really simply saying to Mr.
29 Scott and to the other participants, in particular
30 the two pipeline companies and of course Mr. Bayly who

1 represents COPE, that I hope they will try to develop a
2 program for January and February that enables us to do
3 that. I don't mean the whole of January and February,
4 but I mean beginning sometime in January, and proceeding
5 into February. At any rate, see what can be done.
6 I am not laying anything down that is hard and fast, but
7 I hope counsel will try to do that, so that the people
8 who live in the Mackenzie Delta can participate.

9 MR. MARSHALL: Sir, if I could
10 ask just one question, I was wondering whether it would
11 be your intention to set a specified time during which
12 the inquiry would be in Inuvik. As you can appreciate,
13 there will be some problems in terms of accommodation
14 and so on, and if it were open-ended, we might have some
15 difficulty in arranging hotel space and indeed there
16 might be some difficulty in getting a hall, in which to
17 hold the hearings. I was wondering whether you had
18 reached a decision about that.

19 THE COMMISSIONER: Well --

20 MR. SCOTT: Mr. Commissioner,
21 could I speak to that?

22 First of all, we will be ready,
23 I anticipate to hear the producer evidence in January at
24 Inuvik.

25 THE COMMISSIONER: The evidence
26 of Gulf, Shell and Imperial?

27 MR. SCOTT: Yes, yes. The
28 question of whether it is practicable to hear at the
29 same time or immediately following the applicants'
30 evidence as to the Cross Delta route, depends directly

1 on the availability of the environmental studies in
2 suitable time to permit everybody to at least read the
3 index, not absorb their contents in full, and so the
4 possibility of that being done in January or February,
5 depends entirely on Arctic Gas. We are prepared, if they
6 can get that material to us in adequate time.

2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

So I would propose that we

1 commence in January there if we reach that phase, which
2 I hope we will do. We should sit two weeks, we should
3 then return to Yellowknife, with the understanding that
4 we will return again to Inuvik for one week, at the
5 time when Mr. Bayly's evidence is to be called.

6 THE COMMISSIONER: Well it
7 looks like I've been overruled.

8 MR. BAYLY: It would seem, Mr.
9 Commissioner, my understanding and Mr Scott's are not
10 quite the same.

11 MR. SCOTT: The Inquiry will
12 be in Inuvik substantially longer than two weeks.
13 I'm talking about two weeks of formal hearings,
14 with a return up to one week of formal hearings, which
15 will mean three weeks of formal hearings, there will
16 be a week or two when Mr. Bayly will be able to walk to
17 work because there will be community hearings in
18 Inuvik which I haven't counted. so the Inquiry will be
19 there for a substantial period of time. I'm speaking
20 only of the formal hearings where we have real logistic
21 problems in sitting very far from this room.

22 THE COMMISSIONER: At any rate,
23 I want Professor Jackson to know this will be brought
24 to his attention to convene the committee on the
25 community hearings sometime over the next little while
26 to consider when the community hearings in the delta
27 should take place. It seems to me they ought to occur
28 after we have had the formal hearings in Inuvik so that
29 the people living there will have a good idea what
30 the experts say the impact of the pipeline and the gas

1 plants and the gathering lines will be.

2 At any rate, I'll have to leave
3 that in the hands of all of you people and I'm sure
4 you'll work out an agreement. I think that it's clear
5 that -- I think I've made it clear that I feel and I
6 think counsel agree with me, that we should hold formal
7 hearings in Inuvik in January. for two weeks at least,
8 and that the evidence of the pipeline companies or at
9 least the evidence of the producers, that is Gulf,
10 Shell and Imperial should be heard at that time. The
11 evidence of the pipeline companies if it can be heard
12 as well and it is understood that the evidence of
13 COPE will be heard in Inuvik as well. Once again, I'm
14 not laying that down hard and fast, but I hope counsel
15 will keep my wishes in mind in considering these
16 things and Professor Jackson will have to convene the
17 committee on community hearings and he will also be
18 conferring with the Mayor of Inuvik and the Chairman
19 of the Settlement Councils and the native organizations
20 in the delta, as well as Mr. Butters and other members
21 of the Territorial Council, to work out appropriate
22 dates.

23 MR. GIBBS. Yes, Mr.
24 Commissioner, might I direct some questions about the
25 status of the producer evidence. Is that being called
26 under the umbrella of commission counsel, as the
27 producers are not participants in this Inquiry, The
28 reason I ask is that participants were obliged to
29 furnish lists of all the documents in their possession
30 or power relating to the matters in issue and I'm
wondering whether we look to Commission counsel in that

1 respect on the producer evidence. or whether we look
2 to someone else.

3 THE COMMISSIONER: We're all
4 looking to him at the moment.

5 MR. GIBBS: He seems to garner
6 all eyes when he stands.

7 MR. SCOTT: Commission
8 counsel has complied insofar as he can, with his
9 obligation to produce a list of government documents,
10 and a list of documents within our possession or control.
11 We are calling, though it may be that Mr. Ballem will
12 put the words into my mouth, we are calling the producer
13 evidence. We are not in a position to, and have not
14 been placed in a position, whereby we can provide a
15 list of documents from any of the producer companies.
16 They are not within our possession and when I call
17 someone from Imperial Oil to give evidence about the
18 producer interests and prospects, it will be simply
19 as if I was calling a witness who is a stranger to me
20 and that is precisely what it will be. I will provide
21 a summary of his evidence, in compliance with that rule
22 but I am not in a position, and I understand, will not
23 be in a position to file a list of reports and studies
24 on behalf of the producer companies. They are not
25 participants and there is no obligation on them to
26 file such a list and those documents and the knowledge of
27 them is not within my possession or power.

28 THE COMMISSIONER: The rules
29 I laid down don't apply to them.

30 MR SCOTT: The rules don't apply

1 to them and while the rule apply to me, the documents
2 they have are not within my possession or power.

3 MR. GIBBS: Well sir, we
4 won't produce them at this time, but I perhaps should
5 give notice that we will in due course, when we have
6 devised what we believe a means by which these persons
7 who seem to be parties and yet not parties should be
8 obliged to produce their backup material, the same as
9 every other participant.

10 THE COMMISSIONER: You're
11 saying you will devise a scheme and present it to me
12 sometime in the next little while.

13 MR. GIBBS: Yes.

14 MR. SCOTT: On the timetable
15 again, Mr Commissioner, there has been some complaint,
16 no doubt legitimate from other counsel that we have
17 exhibited a certain indecisiveness from time to time
18 about when we're going to be here and when we're going
19 to there and they complain, and rightly, that they don't
20 always have adequate knowledge of precisely what's going
21 to happen sufficiently far in the future. I don't want
22 to be more arbitrary than is necessary in order to
23 get the work of the Inquiry going, but may I say to
24 all counsel that the proposal that we sit in Inuvik
25 to commence the next phase for two weeks and then return
26 to Yellowknife, is the proposal of Commission counsel,
27 until it's altered by announcement.

28
29
30

1 If they are unhappy with it,
2 I would be grateful if they can consult with me. IF a
3 difference consensus arises, we will announce it; if
4 not, they will have to ask you to make a ruling.

5 THE COMMISSIONER: Okay. Well
6 at 2:25
7 presumably we are farther ahead/than we were at 2. I
8 hope we are .

9 MR. SCOTT: Back to sewage.

10 THE COMMISSIONER: Unwanted
11 sound I thought we were discussing.

12 CROSS-EXAMINATION BY MR. SCOTT, CONTINUED:

13
14 Q Has the panel any esti-
15 mate of how many compressor stations are on permafrost
16 terrain?

17 WITNESS MIROSH: .

18 A We haven't drilled the --

19 THE COMMISSIONER: Excuse me.
20 Miss Hutchinson, would you just make sure that Professor
21 Jackson receives a copy of this whole discussion,
22 and the members of the Community Hearings Committee.

23 Yes, sorry, sir?

24 A We haven't drilled the
25 sites but there are about six compressor stations near
26 and north of Fort Good Hope which would be quite safe
27 to say are on permafrost terrain. The one south of that
28 in the discontinuous region, we haven't assesses.

29 MR. SCOTT:

30 Q What steps does Foothills

1 intend to take, if any, to ensure the stability of sew-
2 age lagoons in permafrost terrain?

3 WITNESS LAZERTE:

4 A By stability, you mean the
5 relation of the bottom of the lagoon to the permafrost ,
6 where it might be in relation to that?

7 Q What steps are going to be
8 taken to avoid degradation of permafrost? Underneath
9 the lagoons and surrounding them?

10 A Fine, I understand.

11 Firstly, I have said this
12 morning that the plans are not firm, but here I think
13 would be the approach. Firstly, we are working on
14 approximately five foot pad fill here, and I believe it
15 only logical to assume that we are not going to want to
16 get down close to that undisturbed layer under that
17 bottom of that five foot fill, with the bottom of the
18 lagoon. Therefore, it follows that to get the depth,
19 we go up with a berm around the lagoon, and then the
20 height of that berm will then determine the relation of
21 the bottom of the lagoon to the permafrost.

22 Q Have you any geotechnical
23 information as to whether this is a feasible solution?

24 A No. I would add one
25 comment. This type of problem in the north can be
26 . handled with modern insulation components beneath the
27 bottom of the lagoon, so these are the kinds of things
28 and approaches that we would take.

29 Q Well is this -- I don't
30 want to press it, but is this at this stage, entirely

1 theoretical without any analysis as to whether it will
2 work?

3 I recognize that these plans
4 are at a very preliminary stage.

5 A The answer to your question
6 is yes.

7 Q So we can put it this way,
8 that if there are any problems associated with that,
9 you are optimistic that by everybody applying their
10 minds, they will be solved?

11 A Correct.

12 WITNESS MIROSH:

13 A Yes. I might add one
14 obvious solution would be a packaged treatment unit at
15 the station.

16 Q Well you say the obvious
17 solution to installing a lagoon is not to install one,
18 but to put in another method of treating sewage?

19 A If that proved to be a
20 problem that would be one solution, yes.

21 Q Don't most of the packaged
22 treatment plants vent to lagoons, in fact?

23 A Yes, they do.

24 Q So whether you go that
25 way or go the lagoon treatment way, you are going to
26 end up with some kind of lagoon, in a permafrost area?

27 A It might be smaller and
28 the impact would be lesser.

29 Q I see. In any event,
30 this is all drawing board stuff, isn't it?

1 A Well we haven't addressed
2 a great deal of effort to this area up until now.

3 Q What do you intend to use
4 as the impervious lining of the lagoon?

5 WITNESS LAZERTE:

6 A Well certainly as outlined
7 in the text, we are going to have to find a type of
8 clay or fine grained material that compacted will retain
9 these liquids.

10 Q So I take it that what
11 you contemplate is a clay, rather than some artificial
12 material?

13 A At the moment, yes.

14 Q Well now in the answer to
15 question 10, you refer as alternatives to the physical-
16 chemical package plant and the biological or activated
17 sludge treatment process. Have you done any work what-
18 ever to determine which is preferable?

19 A Yes.

20 Q And what are your con-
21 clusions about that?

22 A We have no conclusions at
23 the moment.

24 Q Well have you obtained
25 any reports or studies as to the ramifications of using
26 one method or the other?

27 A Yes, we have a consult-
28 ant's report on Mackenzie Valley sewage treatment.

29 Q Yes, and is that filed
30 with your documents that have been produced, or is it

1 too recent?

2 A I listed it on the
3 attachments that were relative to this material. I
4 don't know whether it was filed.

5 MR. SCOTT: I take it, Mr.
6 Gibbs, that that can be made available through your
7 library in the ordinary way, if it isn't there now, yes.

8 Q And I take it while that
9 is a study, it does not lead you, as yet, to any conclus-
10 ions as to which method is preferable?

11 A That's correct. As I
12 mentioned this morning, Mr. Bouckhout has some very fine
13 ideas on this and we're now trying to meld the environ-
14 mental and the engineering together.

15 Q Have you done any studies
16 or conducted any research with respect to the Alyeska
17 experience with these two types of sewage process?

18 WITNESS MIROSH:

19 A Well we haven't conducted
20 any research, but again we have observed the sewage
21 treatment system and lagoon at the delta camp of
22 Alyeska, and from conversations with the contractor
23 operating that particular facility, they have had no
24 problems in either their lagoon or in their incineration
25 equipment.

26 Q Is their process physical-
27 chemical or biological?

28 A You have me there.

29 Q Whichever they are using,
30 it seems to be working, is that what you --

Mirosh, Lazerte, Beer
Cr. Exam. by Mr. Scott

1 A Yes, we were advised it's
2 working and again, I believe that area is on permafrost.

3 Q Now you indicated in your
4 prepared evidence in question 10, that you propose to
5 dispose of the treated effluent from the lagoon by
6 spreading it on swampland, and that you have a consult-
7 ant working on this matter. First of all, who is the
8 consultant?

9 WITNESS LAZERTE:

10 A Could you bear with me?

11 WITNESS MIROSH:

12 A Well the consultant that's
13 doing the sewage report for us at the present time is
14 Associated Engineering Services Limited.

15 Q And I take it they have
16 not yet made a report with respect to this aspect of the
17 matter?

18 A Yes I believe they have,
19 but the report is very recent and it was commissioned
20 by the environmental people. I have not personally seen
21 it yet.

22 Q Well I take it, Mr. Gibbs,
23 that subject to your usual rider, that it contains no
24 propriety information, that this report can be produced
25 in due course?

26 MR. GIBBS: Yes, if I have
27 more success than Mr. Mirosh in prevailing on the
28 environmental people to turn it over to me, it will be.
29
30

1 MR. SCOTT:

2 Q Well I am interested in
3 that observation. Do I understand that your environment-
4 al people have this report now?

5 WITNESS LAZERTE:

6 A I have the report right
7 now. I understand that there's an updating of it coming,
8 but certainly I got it from them. But I understood, if
9 you could just repeat that question to me, I believe the
10 wording of it says, if I might read it, "Studies by an
11 consultant employed by Foothills in the case the use of
12 swampland shows some promise". It doesn't show our
13 intent, it just says "shows some promise".

14 Q And I take it that that
15 report is the only information you have on that parti-
16 cular method of disposing of effluent?

17 A Yes, it's the only one I
18 have, yes.

19 Q And that report is now
20 available for us or can shortly be made available?

21 A Well I have it in my bag
22 here. It's up to Mr. Gibbs what we do with it.

23 Q Well at least in a pre-
24 liminary way.

25 Well now, have your environ-
26 mental consultants been asked as yet to pass on the
27 proposals that are contained in this transcription of
28 your evidence?

29 A Yes. Mr. Bouckhout was
30

1 going on holidays and we had a rather hurried conference,
2 He requested some amendments he made to the engineering
3 contents that I had put into this. I made the changes
4 requested to him to a degree. I would like to comment
5 I am sure that there will be further as we interface
6 with him.

7 Q Well, what is the situat-
8 ion? Does your environmental consultant now approve of
9 the proposals for dealing with sewage that you have
10 laid before the Inquiry?

11 A No, they are not firm and
12 he doesn't approve of these yet.

13 Q I see. Is he with Foot-
14 hills or is he with -- I have forgotten the name of
15 your firm.

16 WITNESS MIROSH:

17 A Mr. Bouckhout is with
18 Foothills.

19 Q I see. Has any of this
20 proposal been submitted to, and I have forgotten the
21 name of the firm who have been providing you with
22 environmental advice.

23 A Lombard North?

24 Q Lombard North.

25 A I'm not certain because
26 the mechanism here was that the environmental depart-
27 ment took the matter of sewage disposal up as their
28 functional responsibility, commissioned the study.
29 Obviously, I was in error when I said we haven't seen
30 it yet. I haven't seen it, but it is recent, and I

1 assume that Mr. Bouckhout would be dealing with Lombard
2 North with respect to that study.

3 Q And I take it that Lombard
4 North will in due course be making a report to you, as
5 will Mr. Bouckhout, on the subject covered by this
6 transcription of evidence?

7 A Yes, under the assumption
8 that Mr. Bouckhout is dealing with Lombard North on
9 this.

10 Q And perhaps that can be
11 produced when it's available, if Mr. Gibbs doesn't
12 object unduly.

13 Do you know of any cases in
14 the north where effluent has been disposed of in this
15 fashion? Successfully?

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

1 A It's my understanding from
2 discussions with Mr. Bouckout that some towns have done
3 this, but that's just a general comment. I wouldn't want
4 to go further than that.

5 THE COMMISSIONER:

6 Excuse me a moment, Mr. Scott,
7 when I said that I wanted Professor Jackson and his
8 committee to consult with representatives of the
9 City Council in Inuvik and the settlement councils as
10 well as the native organizations, I said that he
11 should also meet Mr. Butters, a member of the Territorial
12 Council. He should also meet with Mr. Steves who is
13 I think the other member -- who is the member for the
14 Territorial Council in the Tuktoyaktuk-Aklavik
15 area. I think that includes Sachs as well.
16 I haven't left anybody else out, have I, Mr. Payly?

17 MR SCOTT.

18 Q I take it that Associated
19 Engineering who are doing this report for you are
20 also doing it for Northern Engineering Services, at the
21 same time, are they?

22 A I don't know but that
23 would be a good deal for them.

24 Q Well it's a useful thing
25 to know when they come to submit their bill because
26 you'll --

27 Now can I turn to the subject
28 of noise and I would like to deal with it from a slightly
29 different point of view. I frankly as a layman find
30 the discussion of decibels or decibels or whatever they
are difficult to comprehend, and I want to get a profile.

1 if I can, first on the conditions under which noise
2 travels furthest and I think in the transcript there
3 is some reference to some of these conditions. First of
4 all, what impact do the factors wet or dry air have?
5 Is one of them a better conductor than the other?

6 WITNESS BFR:

7 A Yes indeed. The higher
8 the humidity, the higher the relative humidity. of the
9 air at a given temperature, the less attenuation there
10 will be.

11 Q What about hot or cold
12 air?

13 A I think it rather depends
14 on the way the temperature profile from ground level
15 upwards is in fact set out. In other words if we have
16 a stable atmosphere, or a temperature inversion condition
17 for example, then noise will travel further than when
18 we don't have an inversion condition.

19 Q I take it you've said
20 that attenuation is least over rocky or rock surfaces
21 of some kind, is that correct?

22 A Yes indeed, because there's
23 no absorption of the sound, it gets reflected back into
24 the air.

25 Q And the extent to which
26 there are grasses or vegetation, produces some atten-
27 uation?

28 A Yes, it absorbs the
29 sound energy if you like.

30 Q What about noise over water?

1 A It has a tendency to carry
2 further than over grassland for example.

3 Q Does it carry further than
4 over rockland?

5 A I'm sorry, I can't answer
6 that question.

7 Q I see. What is the
8 effect of a snow covered surface?

9 A The effect is less than
10 if you've got vegetation with no snow over it. In
11 other words there's less attenuation and noise will
12 travel somewhat further.

13 Q Well then can it be said
14 that the effects of snow is nil .

15 A I don't believe that's
16 true. I say it's less than with vegetation.

17 Q I see.

18 A Non-snow covered vegetation
19 as I understand it.

20 Q So noise carries further?

21 A As I understand it, yes.

22 Q Now what about the
23 effects of terrain. Is a sound heard more or less
24 easily when a listener is on the side of a hill facing
25 the sound or on flat ground with the sound at a parallel
26 level?

27 A I'm not sure, could you
28 just run that one past me again?

29 Q Well take the source of
30 the sound and put your listener some distance away, on

1 flat surface, parallel to the source of the sound.

2 A On the same level, on
3 flat terrain, when there are no mountains around or
4 anything.

5 Q Yes. And then compare that
6 to a source of the sound and a man the same distance
7 away, let us say halfway up a hill or an incline?

8 A There is a tendency for
9 him to hear somewhat louder sound, in the case of up
10 on the hill because there's some tendency to reflect
11 back.

12 Q All right. Well now,
13 -- and what about if the sound source is on the hill or
14 on the slope? Does it carry further?

15 A The slope will tend I
16 believe to act as a sort of a mirror, not truly analogous
17 to a mirror, but nevertheless in that fashion and reflect
18 sound back from the hill and away out over the flat
19 terrain or valley or whatever it is you're considering
20 and thus in that area might or probably would increase
21 the sound level to some degree. That would depend on
22 the contours and the vegetative cover and so on and so
23 forth.

24 Q Now let's take a compressor
25 station, and could you describe without attaching any
26 values, a kind of sound that is heard when a compressor
27 station is operating normally. Is it a constant sound
28 or does it have beats attached to it?

29 A In general, it will be a
30 constant sound.

1 It would tend to depend on
2 the precise phase or the precise frequencies of the
3 noise emitted by various items of equipment. There
4 could, under certain circumstances, be some beating, if
5 you like.

6 Q Well, what about it's
7 quality now, insofar as you can judge it. Does it
8 have the impact of a roar or is it a whining sound?

9 A Which, the general noise
10 from the compressor station or the beating?

11 Q The general noise from
12 the compressor station?

13 A There is a tendency for
14 it to be fairly high pitched to the human ear.

15 Q Well now let's deal with --

16 A Excuse me, that's if we're
17 speaking of the turbines, the gas turbines themselves,
18 if we're speaking perhaps of the condenser fans the
19 roar tended to be slightly lower frequency.

20 Q All right, well now taking
21 that description, how would you compare the sound of
22 a line purge?

23 A Of a line purge -- you mean
24 a station purge where we're blowing down a station?

25 Q Yes.

26 A That would have a tendency
27 to be of a lower frequency than the constant noise from
28 say a gas turbine intake.

29 It would be more of a roar than
30 a whine, sir. The whine would tend to come from

1 the turbine, the roar from the station blowdown.

2 Q And it's substantially
3 louder, nonetheless?

4 A Yes, it is louder.

5 Q Now how does an emergency
6 blowdown compare?

7 A Well you want to get
8 rid of the gas as fast as you possibly can and that is
9 what provides as we just said, the substantially louder
10 noise than the constant station noise.

11 Q What about its frequency?

12 A Again, as I say, it's
13 a roar rather than a whine which would be emitted from a
14 turbine.

15 Q I take it that it in turn
16 is louder as well, is it?

17 A Louder than what sir?

18 Q Than a maintenance
19 blowdown?

20 A Yes, you can arrange it
21 that way, certainly.

22 Q How long does a maintenance
23 blowdown take?

24 A That's a question which
25 is a little difficult to answer at this stage, you can
26 size your blowdown line for example, to increase the
27 length of time over which the blowdown will take place
28 and in that fashion decrease the noise level that would
29 be emitted during a normal station blowdown. It might
30 extend from two minutes to ten minutes, depending as I

1 say on the noise level you wish to attain and the amount
2 of gas that you have to get rid of from the station
3 piping.

4 Q Well what is proposed
5 here?

6 A Specifically we don't
7 have a length of time for a station blowdown at this
8 point in time.

9 Q Now, are you familiar
10 with any of the locations of the stations on this line,
11 because I want to ask you to estimate in certain circum-
12 stances the extent to which these noises can carry.

13 A Familiar with the
14 terrain for example, around the compressor stations
15 or the specific locations of each individual one?

16 Q Let me give you an
17 example and perhaps one of your colleagues can help you.
18 If you take number one station at Mile 46, which is north
19 of Inuvik, described as a relatively level area, of
20 tundra vegetation, with no trees, and taking the
21 maximum carrying conditions. that you described, how
22 far in your judgment is the noise of the normal compression
23 station going to carry at that location?

24 A Specifically I can't give
25 you an answer but it's going to be several thousand feet.

26 WITNESS MIROSH:

27 A Could I perhaps here having
28 observed by my ear I guess noises at some compressor
29 stations, in Alberta, one with which I'm familiar is
30 called Hussar. This station has about five or six gas

1 turbines in it, about 50 or 60 thousand horsepower,
2 At the fence line one can carry on a conversation quite
3 easily, perhaps a half mile away one would not hear
4 anything. That's about the magnitude of noise. Now that
5 is rolling grass badland type of terrain which might
6 be equivalent to the area of station one.

7 Q What I'm trying to do
8 here is remove from consideration for the moment subjective
9 values such as that, which amount to saying I can carry
10 on a conversation and be heard if I speak in normal
11 terms. What I would like to get, for a number of sites,
12 about which some questions have been asked, the extent
13 to which the sound of either a normal compression station
14 or a blowdown will carry under the maximum conditions.
15 Now if you take station one, do I understand your
16 answer to be several thousand feet?

1 WITNESS BEER:

2 A I mean in the sense as Mr.
3 Mirosh pointed out you can hear perhaps half a mile
4 away at certain Alberta Gas Trunk Line compressor stat-
5 ions, that's several thousand feet.

6 Q And I conclude from that
7 that it's your evidence that if you are standing, leav-
8 ing allowance for your guestimate, if you're standing
9 a substantial distance beyond that, it is your judgment
10 that you will not be able to hear the compressor station
11 with its' normal compression station noises?

12 A There comes a point when
13 you wouldn't be able to hear it, yes.

14 Q And where approximately
15 does that point come, several thousand feet?

16 A Well several more thousand
17 feet presumably.

18 Q Well how about a mile and
19 a half?

20 A Oh, I would say certainly
21 at a mile and a half you would have to listen extremely
22 hard to hear the compressor station.

23 Q All right, well now what
24 about at that same location, the sound of blowdown?
25 How many miles away must you be before that sound is in-
26 audible to you?

27 A Specifically, I can't
28 answer your question.

29 Q Have you any judgment at
30 all?

1 A Not really, no.

2 Q Well now, what about
3 compressor station CO4? Now that's six miles -- have
4 you found it there?

5 A Yes, I have.

6 Q That's just to the south
7 of Fort Good Hope.

8 A No, I believe not, sir,
9 I think it's a considerable distance north of Fort Good
10 Hope. I think the station you are referring to may be
11 CO6. Yes, but it's a considerable distance from Fort
12 Good Hope.

13 Q I'm sorry, CO4 I intended
14 to refer to and it's just south of the Thunder River,
15 isn't it?

16 A Yes, I guess so.

17 Q Well now, if someone is
18 on the other bank of that river, the Mackenzie River,
19 how far away does he have to be in maximum carrying
20 conditions, before the sound of a normal compressor
21 station becomes inaudible to him?

22 MR. GIBBS: Surely, Mr.
23 Commissioner, we are getting to a point where there can
24 be no sensible answers. How far wide is the Mackenzie
25 River? Is it in flood or is it frozen? It's like
26 asking the witness how high is up, there really is no
27 practical answer. It depends on the air conditions and
28 everything.

29 MR. SCOTT: I'm concerned with
30 some of these questions, Mr. Commission, and they are

1 difficult to answer and they call for a refined judgment
2 which these gentlemen, with their experience can give.
3 I am concerned about them, because if we get into
4 community hearings it's not an unusual question. Will
5 we be able to hear the compressor station that is
6 located, and shown on the map near us. Will we be
7 able to hear a blowdown?

8 Now, it may be that some of us
9 will have different views about that, but I think we
10 are entitled to the judgment of the experts before the
11 project is built, as to what the sound effects will be.

12 MR. GIBBS: One of the problems,
13 sir, is that this kind of question presumes that a blow-
14 down is always the same length of time and the same
15 noise level, which perhaps my friend doesn't know, but I
16 can tell him is not the case. Every single air factor
17 and ground factor and the volume of gas escape and so
18 on, affects the sound and penetration of the blowdown
19 noise, and that's why I suggest you can't give a finite
20 answer to these questions.

21 MR. SCOTT: Well a blowdown
22 may be different, but I am talking now about a normal
23 compression station noise, which I presume is more or
24 less the same.

25 THE COMMISSIONER: Well these
26 are all hypothetical questions, but hypothetical ques-
27 tions are permitted to be put to experts, and I think
28 that I'll allow Mr. Scott to proceed, and Mr. Beer, you
29 just do the best you can. If you don't know the answers,
30 I know you will say so.

1 MR. SCOTT:

2 Q How about CO4, Mr. Beer,
3 if you're on the other side of the Mackenzie River at
4 that location?

5 WITNESS BEER:

6 A From CO4 I would say you
7 would have a hard time hearing it on the other side of
8 the river. I would have to point out, Mr. Scott, that
9 we have done virtually no specific studies on how far
10 noise will carry from any given compressor station.

11 Q Do you intend to do that?

12 A At this stage. Yes, we
13 do.

14 Q I see. When will that
15 work be available? Maybe that's as hard a question to
16 answer.

17 A That's a difficult quest-
18 ion. It really will depend on -- well, we'll arrive
19 at the final design process.

20 WITNESS LAZERTE:

21 A Mr. Scott, having visited
22 that particular station and been on the ground there,
23 I will hazard a guess that across the river you could
24 not hear that station operating.

25 MR. SCOTT:

26 Q Well --

27 THE COMMISSIONER: What about
28 blowdown?

29 A Quite possibly you could
30 hear the blowdown.

1 MR. SCOTT:

2 Q Well I have no doubt that
3 that report, which will be the best evidence on this
4 subject, will be made available when it's at hand.
5 Right, Mr. Gibbs?

6 MR. GIBBS: If you want it made
7 available, it will be at our library.

8 MR. SCOTT:

9 Q Has that work begun?

10 WITNESS BEER:

11 A No, sir.

12 Q Is there any estimated
13 time at which it will begin?

14 WITNESS MIROSH:

15 A Well I might say that some
16 of the best evidence we have is the 20 or 30 odd comp-
17 ressor stations which have turbines in Alberta. I think
18 as someone on this panel has mentioned, we have taken
19 some sound measurements to get a fix on numbers, but
20 we know by living in that environment with our compressor
21 stations, that problems of sound do not occur.

22 Q Well I am simply asking
23 at the moment, when the work that will be the basis of
24 that study for the Mackenzie Valley will be done?
25 When is it anticipated that the study will begin?

26 A Well I think one could
27 say that we probably have begun by measuring some sound
28 levels around a trunk line station, up to a half mile
29 away. We will probably continue monitoring sound at
30 existing stations under different terrain conditions, so

1 that we can get a handle on how these various parameters
2 affect sound. One of the most significant parameters
3 would be tree growth in the area of the station, and
4 having introduced that, I would say that station 6
5 which would be in a wooded area, would have its sound
6 considerably attenuated from station 1, which would be
7 in a barren area, and which is equivalent to the Hussar
8 station which I have mentioned earlier.

9 Q Well I take it that that
10 answer means that the work on the study has already
11 begun, does it?

12 A Yes, if we call that first
13 material we have gathered the beginning of the study.

14 Q All right. Well now, is
15 the panel familiar with the American Environmental
16 Impact Statement for the Alaskan Arctic Gas application,
17 insofar as it relates to noise?

18 WITNESS BEER:

19 A I haven't read it, no,
20 Mr. Scott.

21 Q Well that report, and it
22 obviously generalizes, because it covers a number of
23 kinds of terrain, but it says that a compressor station
24 of the types that are utilized there carries a radius,
25 under normal operation, of 1.3 miles or a diameter of
26 2.6 miles. Would you agree with that?

27 A Well I would say that
28 that is perfectly possible, MR. Scott. It depends on
29 the level of attenuation that you care to apply to
30 your compression equipment and all the other equipment

1 on the station.

2 I have no knowledge of what,
3 for example, their fence line noise levels might be.

4 Q Well, do you intend to do
5 better than that, or would you regard that as an
6 acceptable standard?

7 A At the present time, we
8 have stated what our intentions are in the sense, in
9 the direct evidence I believe I stated 80 dB, or
10 approximately 60 dBA at the fence line, and how that
11 compares with Alaskan Arctic Gas, I'm afraid -- sorry,
12 Alyeska, I'm afraid I'm not in a position to say.

13 Q Well now the Alyeska
14 report also says that blowdowns are audible in a radius
15 of 15 miles generally, or a diameter of 30 miles. Does
16 that sound reasonable?

17 A It would sound to me as
18 though they haven't made any attempt at attenuating
19 the blowdown noise.

20 Q Well do I take it from
21 that then, that you intend to take steps so that the
22 radius of the noise of a blowdown will be less than
23 that?

24 A We certainly intend to
25 take some steps to reduce the noise level to the 90 dB
26 that I mentioned in my direct evidence.

27 Q Well I have some difficulty
28 in dealing with the decibel levels, and I'm much more
29 interested in the radius over which the sound can be
30 heard. I take it that you agree that that is, for

1 Foothills, an unacceptable radius of blowdown sound for
2 this valley?

3 A We would attempt, I
4 believe, to reduce that radius below the 15 miles,
5 certainly.

6 Q To what extent do you
7 think you can reduce it? Can you cut it in half?

8 WITNESS MIROSH:

9 A I wonder, there are a
10 number of parameters which go into a blowdown. One
11 would have to see exactly what volume of gas and what
12 time frame and through what kind of a valve and piping
13 this particular report refers to. If it's gas, I take
14 it if it's Alyeska, it might not be gas.

15 Q It's Arctic Gas.

16 A Arctic Gas, I'm sorry.

17 Q What concerns me is what
18 is the answer that is to be given to people who live,
19 let us say, eight miles from a compressor station when
20 they ask "Am I going to hear the sound of a blowdown"?

21 A Well first of all, if
22 I could follow that through, a blowdown happens only
23 under emergency conditions and --

24 Q For maintenance reasons,
25 doesn't it?

26 A For maintenance one can
27 blowdown very slowly and keep the sound level down to a
28 whisper, if this was a requirement. Under emergency
29 conditions, the primary concern is safety and the gas
30 is evacuated as quickly as possible, but this means

1 that the sound lasts for no longer than 1 or 2 minutes.
2 It's merely a burst, and after that, it won't be repeated
3 until the station shuts down again under an emergency
4 condition.

5 Q Well let's leave the
6 emergency situation out of consideration. If the people
7 asked and the animals could speak and they asked, and
8 they said can -- am I going to be able to hear a
9 maintenance blowdown, what will I tell them the position
10 of Foothills is? To what extent are they prepared to
11 attenuate that, so that beyond a certain distance it
12 will not be audible?

13 A Well if you are talking
14 about a maintenance blowdown which is not an emergency
15 condition, I think these can be controlled by reducing
16 the speed at which the gas is expelled, and the sound
17 will be considerably lower. I don't know how to put a
18 number on that..

19 WITNESS BEER:

20 A I would say, Mr. Scott,
21 in this respect, that we can say that the level of noise
22 in a maintenance blowdown can be controlled so that it's
23 no louder than normal station operating noise.

24 Q All right --

25 A So that, coming back to
26 our previous discussion, you might hear it half a mile
27 away.

28 Q All right.

29 A But you certainly wouldn't
30 hear it seven or eight miles away.

1 Q All right. Well then
2 generalizing, do I have the authority of this panel, at
3 least, to tell people who ask that the position of
4 Foothills is that in ordinary conditions, the compressor
5 station noise and an attenuated blowdown will be only
6 heard, let us say, half to three-quarters of a mile
7 away from the compressor station?

8 MR. GIBBS: Well no sir, I
9 don't think Mr. Scott has the authority of this panel
10 to make those kind of statements on the noise of blow-
11 downs and so on. Foothills attends all the Community
12 Inquiries and is quite able, I think, to give similar
13 evidence on these noises as this panel is giving.

14 MR. SCOTT:

15 Q Perhaps the persons in the
16 communities are more polite than I, and won't press to
17 the extent that I am, but I would like to be able to be
18 sure that the answer is available. What is the view
19 of the panel?

20 MR. GIBBS: Well sir, the
21 panel has given its view, and Mr. Beer has said that
22 under a normal maintenance blowdown, the noise is going
23 to be no greater than the normal operating noise of
24 the compressor station.

25 Now, I would have thought that
26 that was enough, but then my friend --

27 THE COMMISSIONER: Excuse me,
28 excuse me. That's your position, is it Mr. Beer?

29 A Yes it is, it is possible
30 to do that, and that's what we would attempt to do.

1 MR. GIBBS: And so there he's
2 given that evidence under oath and that obviously can
3 be related, but it's going a bit far when my friend says
4 "Now can I have your authority to tell communities --".

5 THE COMMISSIONER: Mr. Scott
6 says he is content.

7 MR. SCOTT: I think my friend
8 is right. I am content with that as a statement of what
9 is intended at least by the persons on this panel.

10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1 Q In the prepared evidence,
2 in the answer to question 17 .you state and I read only
3 part of it, "We propose to identify noise sensitive
4 wildlife in the vicinity of the pipeline"and later on,
5 "Where special community or wildlife concerns require
6 it, we will apply extra attenuation measures to reduce
7 station noise to acceptable levels."

8 Have you as yet identified any
9 areas that for social, or environmental reasons you
10 regard as noise sensitive?

11 A No.

12 Q Is that work going to
13 be done sometime in the future?

14 A Yes it is.

15 Q And I take it that a
16 report or an analysis will be made listing them and
17 justifying the conclusions?

18 A That is the intention,
19 Mr. Scott.

20 Q Well we'll put that also
21 on Mr. Gibb's list. Will that be done in conjunction
22 with environmental consultants, either in house or at
23 Lombard North?

24 A Yes, they will be very
25 deeply involved in that study.

26 Q And do I take it that
27 it will be your environmental consultants who will identify
28 the criteria that will distinguish what animals are
29 noise sensitive and which are not?
30

1 A Yes, they have the
2 qualifications, I don't.

3 Q Is there any estimate
4 as to when that information may be available to us?

5 WITNESS MIROSH:

6 A No, I think that we'll
7 have to discuss that with our environmental people.

8 Q In answer to question
9 Number 17 again on the second page of the answer,
10 you refer to a number of compressor stations, in
11 Alberta located about two miles from the closest
12 community with individual homes in the order of one half
13 mile away. Can you provide for us the name of one such
14 station, the specifications of the compressor station,
15 and the noise attenuation techniques or specifications
16 that have been applied there?

17 WITNESS BEER:

18 A I, at this time can't
19 provide you with the name of the compressor station
20 specifically. I guess my memory has failed me or some-
21 thing here. I'm afraid I can't do that but that
22 material could be -- could presumably be made
23 available.

24 Q I'd be grateful.

25
26 MR SCOTT: The name of one
27 compressor
28 of the stations that is referred to in that paragraph.
29 the specifications, that is a description of what it is
30 in terms of equipment, and the specifications for the
noise attenuation equipment or techniques that have been

1 there applied and perhaps if you can have this or can
2 develop it, an account of either decibels or distances
3 if you want for various kinds of sound. I'm sorry, Mr
4 Hollingworth?

5 MR. HOLLINGWORTH: Decibels?

6
7 MR. SCOTT: Right.

8 MR. HOLLINGWORTH: What was it
9 you wanted?

10
11 MR. SCOTT: I want in some
12 form the measurement of sound at various distances from
13 that location. I won't ask for testimonials from the
14 individual residents who live half a mile away.

15 A I don't believe they're
16 currently complaining to Alberta Gas Trunk Line anyway.

17 THE COMMISSIONER: Gentlemen,
18 we have a whole afternoon ahead of us and we don't
19 usually get to this stage until closer to five than
20 we are now.

21 MR. SCOTT.

22 Q Now in the last paragraph
23 on that same page, you refer to recent studies and just
24 as a matter of record, what are those studies?

25 A They are referred to in
26 my list of documents which have been provided.
27 It's document five on that list, Mr. Scott.

28 Q Thank you.
29 Now again, when you were dealing with wildlife, two pages
30 following, you say that where special community or wildlife

1 concerns require it, we will apply extra attenuation
2 measures, can you describe for us in general terms
3 what those extra attenuation measures are?

4 A More effective silencers
5 on the inlet and exhaust of gas turbines for example.
6 They would be standard types but just more effective.

7 Q Now in answer to question
8 18, when you were dealing with emissions, on the two
9 following pages you give an estimate first of the
10 concentration of components, as found at ground level,
11 and then you say, thus we may conclude that exhaust
12 emissions from our compressor stations would not result
13 in ground level concentrations high enough to cause
14 problems relative to the federal guidelines. Now
15 leaving aside the federal guidelines, have you referred
16 this question to any of your environmental consultants?

17 A They are looking at --
18 you mean in terms of the effects of those ground level
19 concentrations on such things as wildlife and vegetation.
20 Is that the drift of your question?

21 Q Yes.

22 A They are currently looking
23 at some of this.

24 Q Are they going to make a
25 report to you on it?

26 A I'm expecting that I will
27 get some comments from them.

28 Q Perhaps that report
29 when made can go on Mr. Gibb's list of documents as well,
30 subject to his review of it.

1 MR. GIBBS: I don't mind putting
2 it on the list sir, but I wish my friend would understand
3 that we do communicate with consultants in other than
4 report form and sometimes this information comes by
5 word of mouth, by telephone, by discussion. We don't
6 always end up with the fancy bound copies.

7 MR. SCOTT: Well perhaps my
8 friend will either make the report available when and if
9 it comes forward or put someone on a panel who can
10 answer questions about it when the work has been done.

11 I think those are all the
12 questions I have sir.

13 THE COMMISSIONER: Any re-
14 examination?

15 MR. GIBBS: No sir.

16 THE COMMISSIONER: Well, we
17 might take our coffee break and then you can present
18 your next panel, would that be all right.

19 MR. GIBBS: Yes sir. Thank you.

20 (PROCEEDINGS ADJOURNED)
21
22
23
24
25
26
27
28
29
30

(PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

MR. GIBBS: Sir, this panel will deal with metallurgical considerations related to pipeline design. The panel has been sworn.

DANIEL HOWARD HUSHION, Resumed:

JAMES BRIAN WETTERBERG, Sworn:

ERIC SHELTON, Sworn:

W. BRIAN HOLTSBAUM, Sworn:

MR. GIBBS: At the table on the extreme north end is Mr. Wetterberg, then Mr. Hushion and then Mr. Shelton and then Mr. Holtsbaum.

DIRECT EXAMINATION BY MR. GIBBS:

Q Mr. Hushion, you are an officer of Foothills Pipe Lines Limited?

WITNESS HUSHION:

A Yes, I am.

Q And what office do you hold?

A I'm an executive vice-president of Foothills Pipe Lines Limited.

Q Does the sheet attached to the prepared evidence and having your name at the top, accurately set forth your academic qualifications and your experience?

1 A Yes, it does.

2 Q Would you read it in
3 please?

4 A Education, Bachelor of
5 Science degree in civil engineering, Colorado College,
6 1949. Experience: 1949-1957, Colorado Interstate Gas
7 Company, engineer; from 1957 to present with the
8 Alberta Gas Trunk Line Company Limited.

9 In 1957 as assistant chief
10 engineer, 1959 chief engineer; 1967, manager of
11 engineering and construction; 1968, vice-president of
12 engineering and construction; 1973 senior vice-
13 president. In 1974, appointed executive vice-president
14 of Foothills Pipe Lines Limited.

15 I hold directorships in
16 Algas Engineering Services Limited, International
17 Portable Pipe Mills Limited. I belong to societies
18 such as the Association of Professional Engineers of
19 Alberta; the Engineering Institute of Canada, and the
20 American Society of Civil Engineers.

21 Q Mr. Hushion, would
22 you describe briefly the metallurgical considerations
23 in the design of the Foothills Pipeline?

24 A The proposed pipeline
25 is a 42 inch OD by .540 inch wall grade 70, pipeline
26 designed to transport natural gas at a pressure of
27 1,440 pounds per square inch. For ecological reasons,
28 the gas stream temperature north of Fort Simpson will
29 be controlled within a temperature range of zero degrees
30 Fahrenheit and plus 32 degrees Fahrenheit.

It is important to ensure that the material used in the pipeline will not be brittle at the operating temperatures encountered, and we have therefore specified pipe properties which will ensure that the pipe will behave in a ductile manner, under all conditions of testing and operation.

Q Could you outline some of the more significant differences between the Foothills and Canadian Arctic Gas design in the areas of materials and metallurgy?

Q The major differences between our design and that of CAGPL result from the higher pressure and larger pipe size used in the CAGPL design. Some of these differences are:

1 1. All 42 inch pipe
2 required by Foothills can be manufactured in Canada.
3 Because there is potentially only one pipe mill in
4 Canada capable of manufacturing the 48 inch pipe re-
5 quired by CAGPL, and because of their greater steel
6 tonnage requirements, CAGPL would have to purchase
7 quantities of pipe from other countries.
8

9 THE COMMISSIONER: Mr.
10 Hushion, before you go any farther, you say there is
11 potentially only one pipe mill in Canada capable of
12 manufacturing the 48 inch pipe. That would be the
13 Welland Pipe Mill that Stelco is building?

14 A Yes, that would be
15 the new Stelco steel form and mill that was just
16 completed last June, I believe, or a year ago June.

17 THE COMMISSIONER: Yes,
18 one of the representatives of the Steelworkers said
19 on Monday that that mill was dependent on the plate
20 mill on Lake Erie being completed, and it had not been
21 completed, as I understood his evidence.

22 A No sir, that isn't
23 right. It is fed from the present plate mills that are
24 in Hamilton and Welland.

25 THE COMMISSIONER: I
26 see. Well, were you here on Monday when --

27 A Yes, sir.

28 THE COMMISSIONER: Do
29 you want to straighten me out on that, or do you dis-
30 agree with what that gentlemen said? Mr. Jones, I think.

1 A Well this is in
2 addition to the Steel Company of Canada's facilities.
3 They are enlarging theirs, as I think Mr. Wetterberg
4 will show, they have some six million tons presently now,
5 and this will add additional tonnage to their capacities.

6 THE COMMISSIONER: I see.
7 The panel will deal with that then, I gather?

8 A Yes, we can in some
9 measure or another.

10 2. Foothills utilizes standard
11 pipeline components such as valves, flanges and fittings
12 in its design. The use of A.S.A. 600 pound 42 inch
13 valves is an example. CAGPL will require special com-
14 ponents to be designed and manufactured for their
15 1680 PSIG operating pressure, in a size 48 inch, which
16 has not previously been used for gas transmission pipe-
17 lines in Canada.

18 3. Foothills is using
19 the best Canadian pipe available and a reduced operating
20 pressure to ensure safe operation of the pipeline.
21 CAGPL is using higher pressures and has proposed to use
22 crack arrestors to prevent long fractures in their
23 pipeline. In our judgment, the effectiveness of these
24 proposed crack arrestors has not to date been established
25 and proven. In addition, they have never before, to our
26 knowledge, been used in a natural gas pipeline.

27 MR. GIBBS:

28 Q Mr. Hushion,
29 would you comment on the relative capability of present
30 day technology to provide the pipe and other components

1 for a 48 inch system as compared to a more standard 42
2 inch design?

3 A I believe that
4 the 48 inch grade 70 pipe with .720 wall thickness
5 would test the limit of current pipe manufacturing
6 technology and capabilities, and is in an area unproven
7 in terms of pipeline operating history. Forty-eight
8 inch pipe, as proposed by CAGPL because of its greater
9 change from any previous standard, may present major
10 problems as regards metallurgical considerations, as
11 well as confidence in the supply, production and product
12 reliability of such pipe. Only one Canadian mill has
13 installed facilities capable of producing 48 inch .720
14 wall thickness grade 70 pipe, and while we have high
15 regard for that manufacturer, it has not yet been
16 demonstrated that there is capability for sustained
17 production runs in the quantities required.

18 For these reasons,
19 CAGPL may have difficulty in obtaining the majority of
20 its heavier wall pipe in Canada. This would mean that
21 it would have to obtain a greater percentage of its
22 pipe from unfamiliar off-shore suppliers. This could
23 have serious implications regarding Canadian content,
24 pipe cost and logistics problems. We have in the past,
25 experienced large and unforeseen fluctuations in pipe
26 costs from off-shore suppliers, as compared to those
27 from domestic suppliers.

28 The Foothills system
29 will utilize 42 inch .540 inch wall thickness grade 70
30 pipe. This pipe will be much closer to previous

1 standard specifications, will not present major problems
2 to Canadian pipe mills and their associated steel mills.

3 Q Mr. Hushion,
4 how does the higher pressure of the Canadian Arctic Gas
5 48 inch system influence the pipeline design?

6 A The CAGPL
7 system at the 80 percent stress level, will be operating
8 at 1,680 psi and this pressure is much higher than the
9 historical operating pressure for major transmission
10 systems, which normally would be about 900 to 1,200
11 psi. CAGPL has chosen a system which utilizes one of
12 the largest diameters, heaviest wall thickness and
13 highest strength pipe of any in the world, so that the
14 energy contained by the steel is much higher than in
15 any other pipeline. It is known that the potential
16 problem of long fractures is accentuated by the large
17 amount of energy stored in the pipeline, with increased
18 diameter, wall thickness and pressure.

19 With CAGPL's design,
20 they require notch toughness properties beyond the
21 capabilities of present day technology to prevent
22 ductile fracture, unless their operating pressure is
23 reduced. Therefore, CAGPL plans to limit propagating
24 ductile fractures by the use of add-on fracture
25 arrestors. Various designs have been advanced but the
26 testing of fracture arrestors has been very limited and
27 there is no known field application in North America.
28 In other words, the practicality of arrestors has not
29 been proven.

30 Q Is the pipe

Hushion, Wetterberg,
Shelton, Holtsbaum
In Chief

1 available in sufficient quantities in Canada to satisfy
2 the Foothills requirements?

3 A Our policy is
4 to optimize Canadian production capabilities in the
5 supply of materials for the Foothills project. We have,
6 therefore, worked closely with the Canadian pipe manu-
7 facturers in determining production capabilities and
8 capacities. It has been demonstrated to our satisfact-
9 ion that the technical and supply requirements of our
10 project are within the proven capabilities of the
11 Canadian pipeline industry.

12 Q Mr. Wetterberg,
13 you are manager of the Materials Engineering Department
14 of the Alberta Gas Trunk Line Company Limited?

15 WITNESS WETTERBERG:

16 A Yes, sir.

17 Q Does the sheet
18 attached to the prepared evidence having your name at
19 the top, accurately describe your academic qualificat-
20 ions and experience?

21 A Yes, sir.

22 Q Would you read
23 that in, please?

24 A Education,
25 Bachelor of Science degree in metallurgical engineering,
26 University of Alberta, 1965. Experience, 1965 to 1968,
27 Dosco Steel Corporation, technical assistant to the
28 superintendent, steelmaking division.

29 1968 to present,
30 Alberta Gas Trunk Line Company Limited. 1968-1970,

1 an Engineer II; 1970 to 1972, a Senior Engineer;
2 1972 to 1973, Supervising Engineer; 1973 to 1974,
3 Assistant Manager; 1974 to the present time, manager
4 of the Materials Engineering Department.

5 Societies, Association
6 of Professional Engineers, Geologists, Geophysicists
7 of ALberta; Engineering Institute of Canada; Canadian
8 Standards Association membership on the Committee on
9 Pipe Line Materials, Committee on Gas Pipe Line Codes,
10 and Joint Subcommittee on Properties of Materials.
11 The American Gas Association, Pipeline Research
12 Management Committee, American Society of Metals,
13 National Association of Corrosion Engineers, also a
14 member of the Physical Metallurgy Sub-committee of
15 The National Advisory Council of Mining and Metallurgy.

16 Q Mr. Wetterberg,
17 will you describe where the Foothills pipe will be
18 produced?

19 A There are two
20 pipe manufacturers in Canada who have the technical
21 expertise and will have the production capabilities to
22 produce pipe to the requirements of the Foothills'
23 project. One is Interprovincial Steel and Pipe
24 Corporation, with steel making facilities in Regina,
25 Saskatchewan, and pipe making facilities in Regina,
26 Edmonton and Calgary.

27 The other manufacturer
28 is the Steel Company of Canada, with steel making
29 facilities in Hamilton, Ontario and pipe making
30 facilities in Welland, Ontario and Camrose, Alberta.

1 Q I believe that
2 there are now tables that you would like to explain to
3 the inquiry?

4 A Yes, sir.
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1 Table one which shows
2 manufacturers referred to, these manufacturers
3 known for their high quality production of both steel
4 and line pipe for gas transmission. This table one
5 describes the steel ingot capacities of these companies
6 as well as pipemaking capacities of the first two,
7 Stelco and IPSCO, Interprovincial Steel and Stelco of Canada

8 Lines and locations. and the
9 steel ingot tonnage of each one of these, 6 million
10 tons for the Stelco plant.

11 I believe sir that you were
12 inquiring as to what the Lake Erie plant would
13 produce. That will increase this another 1.3 million
14 tons. That won't come onstream until 1978.
15 However it will not increase their plate making
16 capacity until a new mill, plate mill is constructed
17 and that will come on stream about 1980.

18 These milages per day,
19 and tons per year, have been verified by the various
20 manufacturers listed here and they're also substantiated
21 by past experience with pipe orders we have had with
22 Alberta Gas Trunk Line.

23 It illustrates here that
24 the total ingot capacity is 11 million tons, the total
25 pipemaking capacity of the mill is 1.455 million tons.
26 This is the pipemaking capacity of the 24 to 42 inch
27 pipemills. It does not consider the smaller diameter.

28 THE COMMISSIONER: Or the
29 larger, does it? The 24 inch to 42.

30 A I related this to Foothills

1 project.

2 Q Oh, I see yes all right.
3 So we're just considering their capacity to fulfill
4 Foothills needs?

5 A That's correct.

6 THE COMMISSIONER. All right.

7 MR GIBBS. The next table.
8 describe table two please.

9 THE COMMISSIONER: That should
10 be marked.

11 MR. GIBBS: There are sir,
12 three of these tables and I'm ask that collectively they
13 be marked as one exhibit, they go together.

14 THE COMMISSIONER: Fine.

15 A Table two outlines the
16 Foothills project linepipe requirements in thousands of
17 tons per year. Your scale going across and the
18 company's involved in transporting delta gas, HETL,
19 Delta and Trans Canada Delta and Westcoast. The
20 Delta reference is buildups in the AGTL system that
21 would be required in addition to handle the Arctic
22 volumes as in the Trans Canada situation. The sub total
23 down here defines the totals required for each given
24 construction year, or for pipe manufacturing year. It
25 also includes the gas community requirements of 19,000
26 tons of pipe.

27 Down at the bottom of the table
28 we have also included the Alberta Gas Trunk Line's
29 base expansion and to the best estimate, Trans Canada's
30 base expansion, again, for the given years.

1 We arrive at a total tonnage of 482,000 tons that would
2 be required for 1976-77 and so on down in this line
3 here.

4 In our discussions with the
5 pipemills they have dedicated tonnage -- pipe tonnage
6 to the project, to the Foothills project. That has
7 been enumerated down in this last line here. We
8 subtract our requirments, from what has been dedicated
9 we find that we are not in fact putting an overburden
10 on the pipemills to produce for our project.

11 THE COMMISSIONER: Excuse me,
12 Mr. Wetterberg, would you run through that again. Let
13 me see if I understand you. In the winter of '76-'77,
14 you will require delivery of 194,000 tons of pipe, am
15 I right?

16 A 194,000 tons of pipe
17 for just the Alberta Gas Trunk Line, base condition,
18 and the Trans Canada base condition.

19 Q I'm sorry, 482---

20 A 482, that's correct.

21 Q Now, what is the dedicated
22 tonnage again?

23 A This second bottom
24 line, 687,000 tons.

25 Q Yes, but what does that
26 represent?

27 A That represents tonnage
28 that the pipemill would book or dedicate to this program
29 or to this project. They will guarantee us or assure
30 us that we can have 687,000 tons although we find

1 that our requirements are only 482.000 tons.

2 Q Oh, they have already
3 indicated to you that they can supply you with up to
4 687,000 tons in '76-'77?

5 A Yes sir.

6 Q And that means that -
7 oh, I see, I follow you, all right.

8 A Now if we carry that
9 across here we see that in no instance are we below
10 the dedicated -- or above the dedicated I should say,
11 yet our requirements are always less than the tonnages
12 dedicated.

13 Q Yes, I understand.

14 A In fact we have said what
15 the excess is here.

16 Q So you're saying the
17 steel industry has already indicated to you that it can
18 fulfill your needs?

19 A Yes sir. And in this
20 dedication of course, they have already considered other
21 business that is in progress or that they're aware of.

22 Table three.

23 Table three is just a method
24 or a mannerism here of projecting the total requirements
25 of the project and relating that to the pipemill
26 capacity to give you some appreciation of perhaps what
27 the mill loading is going to be and this is during,
28 again, the construction years which we saw on table two,
29 and this is the percentage of our -- of the total pipe
30 mill capacity that we will be taking. You can see that

1 36 percent is the highest percentage that we will be
2 taking and then that dwindles off to something less than
3 one percent at the end of project.

4 Q Well that has a bearing
5 on supply routes. -- probably somebody's coming to this
6 but maybe you could just tell me if it is your intention
7 to bring the pipe from these Canadian manufacturers
8 to the Mackenzie Valley by rail to Hay River and by
9 barge down the Mackenzie is that essentially the
10 program?

11 A Yes sir. I understand that.
12 MR. GIBBS: Thank you Mr.
13 Wetterberg. Might those briefs sir, be given one
14 exhibit number.

15 (3 TABLES RE STEEL CAPACITIES AND REQUIREMENTS MARKED AS
16 EXHIBIT 252)

17 MR. WETTERBERG: It can be seen that there
18 is ample pipemill capacity available to satisfy the
19 requirements of other customers. the manufacturers
20 may have . Undoubtedly the manufacturers have taken
21 into consideration pipe requirements of others before
22 dedicating pipe tonnage adequate to the needs of the
23 Foothills project.

24 Q Have the pipe manufacturers
25 indicated to you that these tonnages are available to
26 your specifications?

27 A Yes, they have. Both
28 manufacturers have reviewed the Foothills pipe specifi-
29 cation in detail and are of the opinion that they can
30 meet or exceed all of the requirements of this
specification. In support of both the adequacy of pipe

1 specification and the ability of the manufacturer to
2 demonstrate production capabilities in meeting our
3 requirements, AGTL has recently purchased ten miles
4 of project pipe to the Foothills pipe specifications.
5 Five miles to be produced by each of the major Canadian
6 pipe manufacturers.

7 Q Are the metallurgical
8 considerations in the physical design of the Foothills
9 system greatly different from those of pipelines already
10 in existence in Canada?

11 A The only unique or
12 different aspect of the proposed Foothills pipeline is
13 the length of the line transporting chilled gas and
14 the environmental considerations which have been taken
15 into account. The project pipe will be manufactured
16 using conventional production techniques, typical of
17 those used in producing 42 inch grade 65 and 70 line
18 pipe, previously used for large diameter gas trans-
19 mission lines by Alberta Gas Trunk Line and Trans
20 Canada Pipe Lines. Each length of pipe will be
21 visually and non destructively inspected by both
22 Foothills, the manufacturer at many stages of its
23 manufacture. As a final test, each length of pipe
24 will be pressure tested in the pipe mill to approximately
25 300 PSI greater than its operating pressure. Before the
26 pipe is accepted for this project, the pipe must meet
27 or exceed the Foothills pipe specifications, the
28 requirements of the Canadian Standards Association, and
29 the requirements of the National Energy Board.

30 Q You have stated the project

1 pipe will be similar to conventional 42 inch pipe already
2 in the AGTL operating system. To what extent do you
3 have actual operating experience with pipe of this type.

4 A AGTL has successfully
5 installed and has operated without incident approximately
6 250 miles of 42 inch grade 70 line pipes similar to the
7 type being proposed for this line. We're familiar
8 with the response of this size and grade of pipe to
9 manufacturing parameters, transportation, field
10 handling, bending, both automatic and manual field
11 welding techniques, testing and operation. This
12 experience and confidence in the 42 inch grade 70
13 product has been built up over an operating period of
14 six years.

15 Q Would you describe then
16 how the project pipe will differ from the 42 inch you
17 presently have in your system.

18 A The maximum nominal
19 wall thickness of 42 inch high strength line pipe in
20 AGTL's system is 0.503 inches which is 0.037 inches
21 lighter than the project pipe wall thickness, and
22 0.037 inches is approximately the thickness of ten
23 sheets of paper. That will give some consideration of
24 the difference.

25 Additional properties to meet
26 the requirements made necessary as a result of the
27 chilled gas such as higher notch toughness values
28 and lower design temperature will also be required.
29
30

Q In your opinion

then, the pipe for the Foothills project can be produced in Canada?

A The Canadian

pipe mills have, over the past 20 years, demonstrated their capability to produce a reliable product. Based on the care that I have seen demonstrated by these mills in the application of past technological developments, and I would cite the development and introduction of grade 70 pipe some seven years ago as an example, I believe Ipsco and Stelco can and will meet the Foothills project technical and supply requirements.

Q You have dis-

cussed pipe, would you now comment on any special requirements for other components such as valves, flanges and fittings?

A These components

are of the type which have similarly been used for a number of years in the industry and specifically in AGTL's system.

The design of these components for 1440 PSI service and low temperature operation is well established and has been available to the industry for quite some time.

As an example, we will be using standard low temperature 42 inch flanges and valves.

No modification of manufacturing facilities, nor changes in the design of existing valve flanges or fittings will be required

1 to meet the requirements of the Foothills pipeline pro-
2 ject.

3 Q Mr. Shelton,
4 you are a senior engineer in the materials engineering
5 department with the Alberta Gas Trunk Line Company
6 Limited?

7 WITNESS SHELTON:

8 A Yes.

9 Q Does the sheet
10 attached to the prepared evidence and having your name
11 at the top, accurately describe your academic qualificat-
12 ions and experience?

13 A Yes.

14 Q Would you read
15 it in please?

16 A Education,
17 Bachelor of Science degree in metallurgical engineering
18 at the University of Alberta in 1965.

19 Experience: 1965-1966,
20 employed with Dosco Steel Corporation involved in
21 metallurgy and quality control functions associated
22 with iron and steel manufacture.

23 1966-67, employed
24 with Canadian Steel Foundries in the quality control
25 and design of the manufacture of iron and steel castings
26 for various industrial applications.

27 1967-1971, employed
28 by Canadian Steel Wheel as a Works Metallurgist respon-
29 sible for steelmaking, forging, heat treating and
30 inspection quality control functions.

Hushion, Wetterberg,
Shelton, Holtsbaum
In Chief

1971-1975, employed
by the Alberta Gas Trunk Line Company Limited as senior
engineer responsible for developing material specifications,
welding and inspection procedures and conducting
material failure investigations.

I am a member of the
following societies; the Association of Professional
Engineers, Geologists and Geophysicists of Alberta;
the Canadian Institute of Mining and Metallurgy; the
American Gas Association, NG-18 Supervisory Committee;
the American Society for Metals; and the Canadian
Standards Association Committee on pipeline materials;
sub-committee on Steel Pipe; and the American Society
for Testing and Materials.

Q Mr. Shelton,
you wish to talk about the safety of pipelines from a
metallurgical point of view?

A Yes, the main
concern we have in operating a pipeline carrying natural
gas is that the pipeline does not leak and more import-
antly, there is not rupture when it is in service.

Q What do you mean
by leak and what do you mean by a rupture?

A A leak has been
defined as the existence or a development of a fissure
in the pipe or component which permits the escape of
the pressurizing medium but which does not result in
gross deformation or displacement of the pipe or com-
ponent. A rupture is defined as an incident in which
there is a rapid extension of a flaw or defect,

1 accompanied by gross deformation and displacement of
2 the pipe or portions of the pipe and a sudden and
3 violent release of the pressurizing medium.

4 A simple analogy might
5 be a car tire with a leak in it which goes flat slowly
6 as the air gradually escapes, but when a rupture or
7 blow-out occurs, the tire goes flat immediately sometimes
8 with severe consequences.

9 Q What causes
10 leaks and ruptures?

11 A Leaks and ruptures
12 are almost always caused by defects in the pipeline
13 which may arise from a number of sources. I have some
14 tables showing types of defects which have occurred in
15 pipelines, and which have caused ruptures and leaks,
16 historically in the United States in the period 1970 to
17 1972.

18 MR. GIBBS:
19 Again, sir,
20 we have three tables which after they have been ex-
21 plained by the witness, I will ask be marked as one
22 exhibit.

23 A I don't
24 believe there's a lot of explanation required with these
25 tables, but I would like to point out that the number
26 of miles of pipeline which are being considered here
27 are 282,000 miles which essentially encompasses all
28 the natural gas pipelines in service in the United
29 States. The data is collected through the office of
30 Pipeline Safety in the United States, and this analysis

1 includes a three year period from 1970 to 1972 inclusive.

2 THE COMMISSIONER: Does
3 it include gas distribution systems within large cities?

4 A I believe this
5 data here does include those --

6 THE COMMISSIONER:
7 Does or doesn't?

8 A -- does include
9 those --

10 THE COMMISSIONER:
11 Does, yes.

12 A Yes.
13 This table, I would
14 point out also, includes leaks and ruptures. I have
15 the next table showing ruptures only. Now the important
16 point to note I think was pointed out in a previous
17 panel that third party damage accounts for the most or
18 largest number of leaks and ruptures in pipelines and
19 followed by corrosion and material failures, construct-
20 ion defects and other perhaps undefined or undisclosed
21 causes.

22 This table is
23 data from the same period of time and the same sample.
24 It refers only to ruptures, and you can see that the
25 total here is approximately one-quarter of what was
26 involved in the leaks and ruptures total table. Again,
27 third party damage is the most significant, and material
28 failure and corrosion are the next most significant.

29 This third table here
30 shows the operating history of Alberta Gas Trunk Line

1 as relates to ruptures which have occurred in the period
2 of 1957 to 1974, which is almost 20 years since the
3 company has operated gas transmission pipelines. You
4 can see that in sizes 36 inch and larger, there have
5 been no ruptures, and there have been six in total.
6 Eighteen inch and larger accounted for 5 ruptures, and
7 then there was one rupture on a line smaller than 18
8 inches.

9 MR. GIBBS: Might
10 those three tables then be Exhibit 253, sir?

11 THE COMMISSIONER:
12 Yes.

13
14 (TABLE 1: CLASSIFICATION OF NATURAL GAS PIPELINE
15 LEAKS AND RUPTURES BY CAUSE

16 TABLE 2: NUMBER OF RUPTURES OF NATURAL GAS
17 PIPELINES BY CAUSE

18 TABLE 3: . INCIDENCE OF OPERATING RUPTURES ON
19 THE AGTL GAS PIPELINE SYSTEM,
20 ALL MARKED AS EXHIBIT NUMBER 253)
21

22 A It can be seen
23 that the incidence of ruptures on natural gas pipelines
24 is very low considering the great number of miles of
25 pipe in service, some of which are very old. I noted
26 the table from Alberta Gas Trunk Line already. We have
27 over 4,400 miles of pipe in service and the incidence
28 of rupture again is very low.

29 In addition, there
30 were no ruptures on any of our 42 inch pipelines, which

1 are similar to the proposed Foothills pipeline.

2 Q You have shown
3 third party damages being the largest cause of pipeline
4 ruptures. Could you explain this more fully?

5 A Third party damage
6 refers primarily to damage caused by equipment operated
7 by people not employed by the pipeline company or work-
8 ing under contract to it. Ruptures of pipelines are
9 generally caused by striking the pipeline because the
10 location is unknown. In the present instance, with the
11 pipeline location being well known, with the relatively
12 low construction activity which takes place in the
13 area of the pipeline, and with the presence of the frost
14 bulb which surrounds the pipeline, the danger of third
15 party damage to the Foothills pipeline is expected to be
16 very much reduced.

17 Q What are the
18 consequences of leaks on a pipeline?

19 A The consequences
20 of a leak in a natural gas pipeline are generally in-
21 significant in that small volumes of gas are released
22 and the leaks are detected at a fairly early stage.
23 The gas which leaks out of the pipeline travels through
24 the ground and dissipates to atmosphere. Expansion of
25 the gas at a leak causes some freezing of the ground
26 in the immediate vicinity, but the effects generally
27 are minimal.

28 Q How are the
29 leaks detected?

30 A There are a

1 number of ways of detecting leaks in pipelines, which
2 have been used by gas transmission companies. These
3 include regular surveillance of the pipeline by air-
4 craft, ground inspection surveys using flame-ionization
5 equipment which determines whether natural gas is
6 present, and may include inspection devices which use
7 such techniques as acoustic measurements to locate
8 leaks.

9 Q Could you des-
10 cribe the consequences of ruptures?

11 A Ruptures are,
12 of course, much more serious in that when they occur a
13 major disruption of the pipeline results and causes,
14 in fact, the pipeline to be immediately shut down. In
15 some cases, a fire may also result during the bursting
16 of the pipe. Historically, this occurs in about half
17 the cases in which ruptures take place, but probably
18 would be lower for this pipeline which is for the most
19 part, in frozen ground.

20 Q Would you des-
21 cribe how leaks and ruptures are prevented?

22 A Prevention of
23 leaks and ruptures basically is accomplished by prevent-
24 ing the types of defects which I mentioned earlier from
25 occurring in the pipeline. The quality control and
26 inspection procedures must begin at the point of manu-
27 facture of the products and carry on through shipping
28 and construction of the pipeline and also through to
29 the operation.

30 As Mr. Wetterberg

1 has described, we take special precautions during the
2 manufacture of pipe and piping components, to ensure
3 that the highest quality material is obtained, and that
4 cracks and other types of injurious defects are detected
5 and removed. Similar practices are following during the
6 shipping of materials and construction of the pipeline.

7 As noted in the table
8 showing types of defects which have historically resulted
9 in pipeline operational problems, one of the major causes
10 of leaks and ruptures, aside from third party damage,
11 has been corrosion. Mr. Holtsbaum will discuss this
12 topic and the measures that have been taken to ensure
13 corrosion is prevented during the operation of the Foot-
14 hills pipeline.

15 Also included in the
16 techniques designed to ensure that the pipeline is
17 defect-free, is the use of high pressure hydrostatic
18 proof testing immediately following construction. This
19 assures that the pipeline can safely withstand press-
20 ures well in excess of the operating pressure. After
21 operation of the line begins, the procedures that I
22 mentioned previously are used to detect leaks and also
23 to detect defects which may eventually develop into
24 leaks during the period of pipeline operation.

25 For example, here we
26 would include the use of internal inspection devices,
27 commonly called inspection pigs, which travel down the
28 pipeline in the gas stream and locate areas where
29 defects exist. Facilities have been provided in the
30 design of this pipeline to allow these types of

1 inspection devices to be used on a regular basis.

2 Q Would you now
3 define or explain the expression ductile fracture?

4 A By ductile
5 fracture we are referring in general to a fracture in
6 which the steel deforms plasticly during failure as
7 opposed to a brittle failure, where there is little
8 plasticity at failure. An analogy might be the differ-
9 ence between breaking a rubber band and a piece of glass.
10 The rubber band will stretch considerably before it
11 breaks, while the glass stretches very little.

12 Q Mention was made
13 earlier of ductile fracture propagation. What does
14 this refer to?

15 A Theoretical
16 studies have shown that some ductile fractures could
17 travel long distances when a rupture occurs, although,
18 in fact, this has not proved to be a problem in
19 practical -- a practical problem in the operation of gas
20 pipelines in North America, nor in fact in other parts
21 of the world.

22 However, in recogni-
23 tion of the potential problem, Foothills in its design
24 has decided to specify pipe toughness sufficient to
25 ensure that propagating factors will arrest under the
26 conditions of operation, even though such long propagat-
27 ing fractures have not occurred in Canada.

28 Q Could you des-
29 cribe this problem of fracture propagation in more
30 detail?

1 A The phenomena
2 which occurs when a pipeline ruptures is that a crack
3 is produced which may run down the pipeline under the
4 influence of the internal pressure. The lower the
5 pressure and the better the mechanical properties of the
6 pipe, the less likely the crack is to run in the pipe-
7 line. The Foothills pipeline design utilizes a reduced
8 operating pressure as well as pipe of the highest qual-
9 ity and best mechanical properties available to prevent
10 ductile propagating fractures of the type that has been
11 predicted by some research groups.

1 Q Does your approach involve
2 the use of fracture arresters in connection with this
3 problem?

4 A No, we have not seen
5 sufficient experimental or practical data to demonstrate
6 that fracture arresters are in fact necessary or that
7 they work effectively for pipelines. Additionally
8 there is some concern on our part that the use of
9 these arresters may in fact result in additional problems
10 in the safe operation of the pipeline, that is that they
11 may do more harm than good. Corrosion at the location
12 of crack arresters and potential stress concentration
13 effects are possible problems that may arise with the
14 use of such devices. Crack arresters have never to our
15 knowledge, been used to date on an operating pipeline.
16 We are of the opinion that the use of lower operating
17 pressure is a more satisfactory design from the point of
18 view of ensuring that any ruptures which may occur in
19 the pipeline are very short in length.

20 Q Could you summarize then
21 your approach to the problem of leaks and ruptures of
22 pipelines?

23 A The approach we have taken
24 is that ruptures in pipelines are a very rare occurrence
25 and that the best preventative measure is to ensure that
26 ruptures are not initiated. To accomplish this, we
27 have specified mechanical properties of the pipe, such
28 that the size of defects necessary to cause rupture are
29 very large. Defects much smaller than this will be
30 readily detected during manufacturing of components and

1 and during both construction and operation of the pipe-
2 line.

3 Q Referring again to the mech-
4 anical properties of the pipe, could you explain for us
5 some of the important properties which concern you?

6 A Probably the two most im-
7 portant mechanical properties of a pipeline steel are
8 the strength and the toughness. The strength refers to
9 the amount of load the pipe can carry and in effect, the
10 amount of internal pressure which can be sustained by the
11 pipeline. The strength of pipeline steels are measured
12 using a standard tension test specimen. This is simply
13 a piece cut from the pipe, which is stretched in a large
14 machine to measure its strength. Additionally the
15 integrity of the pipe is verified during the course of
16 manufacture by pressure test in which a high internal
17 pressure of approximately 1800 PSI is introduced into
18 the pipe and held for a short period of time. This
19 ensures the pipe will not leak or rupture. The
20 toughness of the steel refers to the ability of the
21 material to withstand the loads, the applied loads, in
22 the presence of a defect. Again, our standard mechanical
23 tests which are used to ensure that the toughness of the
24 pipe components being purchased meet the design require-
25 ments of our specifications. The commonly used test to
26 monitor toughness of the steel is the Charpy V-Notch
27 test. A small sample of the steel is specially machined
28 and tested under impact loading conditions. An important
29 part of the specifications for material which Foothills
30 Pipe Lines is using is the specification of notch

1 toughness values for all components. As I mentioned
2 earlier, this will be sufficient to prevent the initiation
3 of fractures unless very large defects are present.
4 Again, much smaller defects would readily be detected
5 during fabrication of the pipeline components or during
6 operation of the pipeline.

7 Q The steel you are proposing
8 to use for this pipeline is of high strength and high
9 toughness. Is this steel attainable?

10 A As Mr. Wetterberg has
11 pointed out, these materials are available from
12 Canadian pipe mills and have in fact been utilized
13 by the Alberta Gas Trunk Line. The latest manufacturing
14 technology has been incorporated in the manufacture of
15 these materials and we believe that the components we
16 have specified are readily available.

17 Q You have noted that the
18 strength and toughness of the pipe materials are
19 important. Are there other pipe material properties
20 that should also be considered?

21 A There are a number of other
22 requirements listed in our specifications, related to
23 chemical and mechanical properties, dimensional toler-
24 ances and inspection requirements which are designed to
25 ensure that the product which we receive is defect
26 free and can be readily utilized during field construction.

27 Q By field construction, you
28 are referring for example, to the welding of pipe. How
29 is the weldability controlled?

30 A The weldability of the pipe

1 is primarily controlled by the chemical composition
2 and this is specified as part of our Foothills
3 specifications. The materials which are proposed for the
4 manufacture of the pipe have been used previously by
5 Alberta Gas Trunk Line and the weldability has
6 been demonstrated during several years of pipeline
7 construction.

8 Q How will you ensure the
9 welds which are produced during field construction are
10 defect free?

11 A Comprehensive inspection
12 procedures have been included as part of the construction
13 specifications. These require the use of nondestructive
14 testing techniques as well as very close on-site
15 inspection supervision. All field welds will be radio-
16 graphed for 100 percent of their circumference to ensure
17 no defects are allowed to remain. Supplemental non-
18 destructive testing techniques such as ultra sonic,
19 magnetic particle and dye penetrant inspection procedures
20 are also used to ensure weld quality. Additionally, all
21 sections of the pipeline will be subject to a hydro-
22 static test after welding is completed which provides
23 additional assurance that the pipeline will operate
24 reliably and safely.

25 Q Mr. Holtsbaum, you are
26 the vice president of Associated Corrosion Consultants
27 Limited?

28 A Yes.

29 Q Does the sheet attached
30 to the prepared evidence and having your name at the

1 top accurately describe your academic qualifications
2 and experience?

3 A Yes.

4 Q Would you read it in
5 please?

6 A Education, BSC in
7 Engineering, University of Alberta, graduated in
8 1958.

9 Experience, Continuously
10 involved with the study of corrosion and its control
11 since 1958. Entered private practice as a founding
12 principal of Associated Corrosion Consultants Ltd. This
13 firm, together with its affiliated firm, Bio-Chem
14 Consulting Services Limited provide a broad spectrum
15 of independent consulting services, including corrosion
16 investigations, cathodic protection design and testing,
17 contract specifications, coating and inspections,
18 water quality and microbiological studies and
19 corrosion monitoring. Present position is Vice-
20 president and Director of Associated Corrosion
21 Consultants Ltd. and Bio-Chem Consulting Service Ltd.

22 Membership in Societies, as
23 follows:

24 Association of Consulting
25 Engineers, of Canada; Association of Professional
26 Engineers, Geologists and Geophysicists of Alberta;
27 Association of Professional Engineers of the Province
28 of British Columbia; Association of Professional
29 Engineers of Saskatchewan; and the National Association
30 of Corrosion Engineers, where I served on various

1 executive positions, and recognized as a corrosion
2 specialist.

3 Q Mr. Holtsbaum, are you
4 responsible for the provisions for corrosion control
5 which appear in part three, Section B8 of the Foothills
6 Pipe Line Limited application?

7 A Yes, I am.

8 Q How is the pipeline to be
9 protected from corrosion?

10 A Control of corrosion on
11 a pipeline varies as to the exposure. The pipeline is
12 essentially exposed to three basic environments, the
13 atmosphere, the soil and the gas stream. The first,
14 atmospheric corrosion control,

15 Atmospheric corrosion is not
16 expected to be a significant problem. A coating
17 applied to the exposed portions of the system will
18 control any corrosion which might otherwise occur.
19 Maintenance of this coating will be carried out over the
20 years required.

21 The second, soil side corrosion
22 control.

23 The pipeline will be at a lower
24 temperature than pipelines in the south. This fact
25 itself serves to reduce the rate of corrosion.

26 The control of any soil side
27 corrosion which may then occur can be achieved by an
28 inert coating applied to the exterior of the pipe, and
29 by cathodic protection.

30 The function of the coating is
to provide a barrier between the pipe and its environment.

1 A satisfactory coating must therefore be inert to the
2 environment, be a good electric insulator, not subject
3 to deterioration in a soil environment, be well bonded
4 to the pipe, and have a good resistance to damage from
5 external forces. The coating may be applied in a coating
6 plant, in which case the girth welds would require field
7 coating. Alternatively, the entire coating may be
8 applied after welding of the pipe just prior to lowering
9 into the ditch.

10 It is the experience of industries
11 that a perfect coating cannot be practically realized and
12 that failures in the coating (termed "holidays")
13 which occur. The pipe exposed at these "holidays" will
14 then be protected from corrosion by the application of
15 "cathodic protection". This is the name given to a
16 method of applying a DC electric current to an underground
17 structure in sufficient quantities to overcome the
18 naturally occurring corrosion cell currents. The area
19 of bare steel exposed to the soil at the "holidays" is
20 the predominant factor in determining the amount of current
21 which must be applied to realize full protection.
22 Sufficient current capacity will be installed to provide
23 complete cathodic protection to all underground facilities
24 regardless of coating damage.

25 The third, the Internal
26 Corrosion Control.

27 The most fundamental condition
28 for internal corrosion to occur is that water must be
29 present. Corrosion on the inside of the pipeline before
30 the line is operational could be caused by traces of

1 pressure testing wire left in the line. This water will
2 therefore be both chemically and microbiologically
3 analyzed to determine its corrosive qualities. The
4 appropriate treatment will then be implemented to
5 reduce its potential for corrosion.

6 After the line is operational
7 the water content in the gas stream is to be minimized
8 at the source, thereby controlling the potential for
9 corrosion. This condition is to be closely monitored.
10 If water does enter the line, appropriate action will
11 be taken to remove it.

12 Although internal corrosion
13 is not expected to be a problem, it would proceed at a
14 much reduced rate due to the low temperature.

15 Q Describe the facilities which
16 are involved in the application of cathodic protection
17 to the pipeline?

18 A The Cathodic protection
19 equipment will consist of several impressed current
20 cathodic units. Each unit in turn is comprised of a DC
21 electric power source, a group of anodes, termed a
22 groundbed, and cables, connecting the pipe to the
23 power source and the power source to the groundbed.

24 The ground path completes the
25 circuit for the DC current. There will be no harm to
26 humans due to this current in the ground.

27 The cathodic units are to be
28 located at, but are not necessarily limited to, each
29 compressor station.

30 The DC power source at the

1 station would be a rectifier and, at sites remote from
2 the station, would either be a rectifier where
3 power is available, or a thermo electric generator.
4 The ground beds are to be installed in frost-free soil
5 wherever possible. For this reason, the installation
6 of deep anode groundbeds at most stations is anticipated.
7 This installation would be contained within the station
8 yard.,

9 Test points are to be installed
10 at regular intervals along the pipeline to provide a means
11 of testing the pipe to determine the status of protection.

12 Three to four surveys along
13 the line are anticipated during the first year. There-
14 after, an annual survey to confirm the status of pro-
15 tection would be conducted.

16 The materials and installation
17 will be controlled by detailed specifications. The
18 materials will be suited to operation in the Northern
19 Region. All materials will be inspected prior to shipment
20 to the North and will be re-inspected on site. All
21 active stages of construction of the cathodic system will
22 be thoroughly inspected.

23 Q Would you now comment on
24 potential problems related to corrosion and its control
25 which may occur with the use of add-on fracture
26 arrestors?

27 A This would depend on
28 the construction of the fracture arrestor. If it were
29 to consist of a band around the pipe, which was touching
30 the pipe, but not sealed at the ends water may gain

1 access to the annulus between the pipe and the arrestor.
2 Corrosion may then proceed until the agents supplying
3 the corrosion mechanism are consumed.

4 Unfortunately, if corrosion
5 continues, there is no ready means of control available if
6 the arrestor is in electrical contact with the pipe.
7 Cathodic protection would be ineffective since the
8 arrestor would shield the pipeline from the protective
9 currents.

1 Corrosion on the
2 pipeline can be investigated by the use of an electronic
3 pig which measures the wall thickness using the magnetic
4 principle. The presence of the arrestor, however,
5 would upset the inspection at these points, thereby
6 eliminating the usefulness of this tool in investigating
7 corrosion at the arrestor contact points.

8 The method of prevent-
9 ing this possible corrosion would be to prevent water
10 from initially entering the arrestor "annulus". This
11 would involve special coating procedures at each
12 arrestor.

13 Another disadvantage
14 of this technique is that if such arrestors were spaced
15 at close intervals along the line, they would hinder
16 the application of a field-applied coating on the out-
17 side of the pipe. Unless extra care is taken, they
18 could be responsible for reducing the overall effect-
19 iveness of the external coating.

20 Since Foothills does
21 not, at present foresee the uses of these devices on
22 their pipeline, this source of potential corrosion
23 problems will not exist.

24 Q By way of
25 summary you have concluded that corrosion will not be
26 a problem on the Foothills pipeline system?

27 A Yes, we are
28 confident that external corrosion of the pipeline can
29 be effectively controlled by the application of pro-
30 tective coatings to all external piping surfaces and by

Hushion, Wetterberg,
Shelton, Holtsbaum
In Chief

Cr. Exam. by Marshall

1 complete cathodic protection.

2 MR. GIBBS: That
3 completes the direct evidence of this panel, sir.

4 THE COMMISSIONER:
5 Well maybe we should give you the break to consider
6 your cross-examination, if you would like, or do you
7 want to start now?

8 MR. MARSHALL: I am
9 ready to get started now.

10 THE COMMISSIONER:
11 All right, all right.

12 MR. MARSHALL: Perhaps
13 it will make the evening a little easier. As I under-
14 stand it, we are going to be sitting?

15 THE COMMISSIONER:
16 Yes, yes, yes, good idea.

17
18 CROSS-EXAMINATION BY MR. MARSHALL:

19
20 Q Mr. Hushion,
21 I can start with you please. On page 2 of your evi-
22 dence in answer to question 5, you say that in the para-
23 graph that continues on page 2, from the first page,
24 "theoretically long ductile fractures are a possibility
25 and because of the pioneering nature of this pipeline
26 which involves refrigerated gas and operating in perma-
27 frost soil conditions, a conservative approach to
28 pipeline design has been taken in order to minimize the
29 risk of long propagating ductile fractures occurring.
30 To accomplish this, the operating pressure in the

1 pipeline has been reduced from 1,440 to 1,250 pounds
2 per square inch", and the sentence goes on, and I'll
3 pick up the rest of the sentence in the next series of
4 questions, sir.

5 Do I take it that
6 Foothills is satisfied that by having reduced the oper-
7 ating pressure to 1250 pounds per square inch, the risk
8 of a long propagating ductile fracture not arresting,
9 has been overcome? At any rate, you are satisfied
10 that reducing the pressure to 1,250 PSIG is going to
11 enable this pipe to arrest the propagating ductile
12 fracture?

13 WITNESS HUSHION:

14 A Well it's a
15 reduction of the pressure in conjunction with the notch
16 toughness that is within the body of the steel.

17 Q I see, but to-
18 gether you think that you are able to achieve the end
19 result of arresting these propagating fractures in the
20 event one should occur?

21 A Yes, sir.

22 Q Mr. Hushion,
23 when Alberta Gas Trunk Lines Limited was a member of
24 the Arctic Gas Study Group, did you have a representative
25 on the metallurgy sub-committee?

26 A Yes, we cer-
27 tainly did.

28 Q And then you
29 were aware, were you not, of the burst tests that were
30 conducted by Arctic Gas, at least until the withdrawal

1 of AGTL in September of 1974?

2 THE COMMISSIONER:

3 Excuse me, excuse me, Mr. Marshall. Could you just
4 repeat that question and just go a little more slowly,
5 I'm trying to absorb this.

6 MR. MARSHALL: I'm

7 sorry. I think sir, we were at the point of dealing
8 with the reduction of the pressure in the Foothills
9 line to 1,250 and Mr. Hushion was agreeing that reducing
10 the pressure, together with having a high notch tough-
11 ness in the pipe satisfied Foothills and Mr. Hushion,
12 that propagating ductile fractures could be arrested
13 in this pipe.

14 THE COMMISSIONER:

15 Yes. It was your next question that I was ---
16

17 MR. MARSHALL: All

18 right.

19 Q Mr. Hushion,

20 I'll go back over those few questions. When Alberta
21 Gas Trunk Lines was a member of the Arctic Gas Study
22 group, it had a representative on the Metallurgy sub-
23 committee?

24 A Yes.

25 Q And you were

26 then aware of the burst tests that were conducted by
27 Arctic Gas, at least until the withdrawal of Alberta
28 Gas Trunk Lines from the consortium --

29 THE COMMISSIONER:

30 Did you say first tests?

1 MR. MARSHALL: Burst
2 tests.

3 THE COMMISSIONER:
4 Burst tests.

5 MR. MARSHALL: Yes,
6 sir. There were a series of them, they were testified
7 to by Mr. Holmberg, among others.

8 Q You then, being
9 with Alberta Gas Trunk Lines, at the time were aware of
10 the results of these burst tests that were conducted by
11 Arctic Gas, at least until the time of the withdrawal
12 of Trunk Lines from the consortium which was in September
13 of 1974?

14 A Yes, we are
15 familiar with those tests.

16 Q And specifically,
17 you would have known the results of the burst test
18 conducted July .27th, 1974?

19 A Yes.

20 Q Now sir, I note
21 from the facilities section of the Foothills' applicat-
22 ion, and I'll give you the reference although I don't
23 know that you'll need it in front of you for purposes
24 of response to this question, but I'll leave that to you
25 and Mr. Gibbs. I refer to part 3 Facilities, under the
26 . tab B design and capacity, small tab B-5, page 3B5.5
27 of the metallurgical criteria, starting with paragraph
28 5.2.3. It may be a good idea.

29 The reference sir,
30 was in that volume, small tab B5, page 3B5.5 of the

1 metallurgical criteria, and starting I think particularly
2 with paragraph 5.2.3. The heading there, sir, is
3 design criteria for arrest of ductile fracture at low
4 operating temperatures. We're together, are we?

5 A Yes.

6 Q And does this
7 reference and the succeeding pages set out your design
8 criteria for arresting ductile fractures in the Foot-
9 hills line pipe?

10 A Yes, it does.

11 Q Now sir, you
12 have stated in the application that these criteria are
13 based on work performed by Battele, I believe that's
14 in your evidence as well; do you know, sir, if these
15 are the same criteria that were followed by Arctic Gas
16 prior to their decision to apply crack arrestors?

17 A Yes, I believe
18 we tried to apply those theories to our calculations.

19 Q And that's
20 really based on what's called the Battele hypothesis?

21 A Yes, I believe
22 that is correct.

23 Q Right. Are you
24 aware that in the Battele burst tests of July, -- July
25 27th, 1974, the crack behaviour was contrary to that
26 predicted by the Battele hypothesis, that is the crack
27 continued to run where it was predicted to stop, and
28 stopped where it was predicted to keep running. Were
29 you aware of that?

30 A Yes, I recall

1 reading something like that, yes.

2 Q Yes, and that
3 Battele then advised the metallurgical sub-committee
4 of the study group, of which Alberta Gas Trunk Lines
5 was a member and had a member on that sub-committee,
6 that for some reason their hypothesis, this Battele
7 hypothesis, did not apply to the Arctic Gas pipe?

8 A Yes, that's
9 right. I believe these tests proved some of the
10 fallacies in what was trying to be proved by these
11 burst tests. It shows a lot of the inaccuracies.

12 Q And specifically
13 the hypothesis that had been developed by Battele did
14 not seem to fit with the results obtained in the tests?

15 A That was the
16 conclusion, yes.

17 Q And are you aware
18 that it was as a result of this particular test that I
19 have referred to, the July 27th, 1974 test, that Arctic
20 Gas decided that they would employ crack arrestors, not
21 only on the 48 inch main line, but also on the smaller
22 supply lines including the short 30 inch line in the
23 delta?

24 A Yes.

25 Q Well sir, given
26 that the Battele hypothesis didn't fit the Arctic Gas
27 pipe, why is it then that you are confident that that
28 Battele hypothesis is applicable to your proposed pipe,
29 when Arctic Gas has decided that it doesn't apply to
30 theirs?

Hushion, Wetterberg,
Shelton, Holtsbaum
Cr.Ex. by Mr. Marshall

1 A Well, of course
2 we are not sure that these theories themselves are
3 completely satisfactory and adequate, but excepting the
4 fact that there may be a problem here with ductile
5 fractures, what we have attempted to do was to assimilate
6 as best we could with our pipe and obtain the pressure
7 and the required notch toughness that would satisfy a
8 propagating ductile fracture. In so doing, we also were
9 purchasing pipe with the highest notch toughness avail-
10 able in Canada.

11 Now, admittedly some
12 of the theories are uncertain, but this is the best
13 that can be obtained at this time, and we feel that we
14 must be very close to it, although no one is really
15 positive about these theories themselves, and none of
16 the fracture tests are really indicated or proved.

17 Q Well sir, in
18 deciding on the operating pressures and the notch
19 toughness of the pipe, you did make use of the Battele
20 hypothesis in arriving at what the appropriate levels
21 ought to be, is that not so?

22 A I believe Mr.
23 Wetterberg made those calculations, is that correct?

24 WITNESS WETTERBERG:

25 A That's correct.

26 Q And Mr. Hushion,
27 are you aware that El Paso who proposes a 42 inch gas
28 pipeline across Alaska, independently of Arctic Gas
29 arrived at the decision that crack arrestors were the
30 only means to control failure length, and made this

1 decision after running full scale burst tests?

2 WITNESS HUSHION:

3 A I wasn't aware
4 that they had decided to go to crack arrestors. I
5 have heard of their 42 inch pipeline, mind you. I also
6 recall reading sometime ago that they had some fracture
7 tests run in conjunction with U.S. Steel, that I believe
8 were very far from being entirely satisfactory. So I
9 would think that perhaps their decision has been made
10 rather cursory.

11 THE COMMISSIONER:

12 Could I just ask you these questions which I can tell
13 are coming off the top of Mr. Marshall's head, he is
14 still firing them at you pretty swiftly, and I am trying
15 to keep up.

16 Did you say El Paso's
17 proposal is to go to 42 inch gas pipeline?

18 A El Paso? Yes,
19 theirs is a 42 inch pipeline.

20 THE COMMISSIONER:

21 Didn't you just say El Paso?

22 MR. MARSHALL: Yes,
23 sir.

24 THE COMMISSIONER:

25 Theirs is a 42 inch line?

26 A Yes, sir.

27 THE COMMISSIONER:

28 Gas pipeline?

29 A Yes, sir.

30 THE COMMISSIONER: And

Hushion, Wetterberg,
Shelton, Holtsbaum
Cr.Ex.by Mr. Marshall

1 they propose, you say without a complete examination of
2 the evidence, they propose to use crack arrestors?

3 A I didn't say that,
4 Mr. Commissioner. Mr. Marshall just advised me that
5 this is so.

6 THE COMMISSIONER: Yes.

7 A And I assume
8 that his assumption is correct.

9 MR. MARSHALL: Well
10 sir, just rather than leave the point there, you men-
11 tioned some U.S. Steel fracture arrest tests that were
12 done, and you questioned whether the results were very
13 reliable.

14 Q There is a
15 technical report of U.S. Steel which I understand is in
16 the public domain, and my advisors have provided a copy
17 of it and I understand that in a series of tests that
18 were done for the American Iron and Steel Institute
19 by U.S. Steel, that they obtained very favourable
20 results with the use of crack arrestors, and I have
21 this available for you, and when we get a little later
22 into our cross-examination I will quote you a passage
23 from it.

24 A Mr. Marshall,
25 I believe that El Paso is intending to operate at a
26 much higher pressure, something like 1,620 pounds per
27 square inch, somewhat just less than what CAGPL is
28 intending to use.

29 MR. HOLLINGSWORTH Perhaps if Mr.
30 Marshall is going to use this document in cross-

1 examination, he might produce it to the panel, Mr.
2 Commissioner, so that the whole document could be read
3 by the panel, so that --

4 THE COMMISSIONER:

5 Over the supper hour --

6 MR. HOLLINGSWORTH: -- they
7 can answer the questions more meaningfully.

8 MR. MARSHALL: I would
9 be happy to do whatever I can to help educate the panel,
10 Mr. Hollingsworth.

11 THE COMMISSIONER: I
12 think that's enough for this afternoon. I have to try
13 to absorb this as we go along, and I can't take it any
14 more, so we'll -- no it really is, these gentlemen
15 make themselves clear as we go along, but I think that's
16 enough for now, so we will adjourn now until 8 o'clock,
17 Mr. Marshall, and then you can carry on.

18 MR. MARSHALL: Yes
19 fine.

20
21 (PROCEEDINGS ADJOURNED)
22
23
24
25
26
27
28
29
30

1 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

2 MR. MARSHALL:

3 Q Mr. Hushion, prior to the
4 break, we had been I think dealing with El Paso's
5 decision and their proposed pipeline project, a 42 inch
6 gas pipeline project to use crack arrestors as a means
7 of controlling fracture length and I had indicated that
8 they made this decision after running full scale burst
9 tests. I believe your comment was, they're operating
10 at a higher pressure than Foothills, is that correct?

11 A I believe that their
12 intended pressure is something like 1620 or 1640.

13 Q I think you're right, it
14 may even be 1670. In any event, I'll accept it as
15 higher than what Foothills is proposing to operate at,
16 but would you agree with me Mr. Hushion that really the
17 most important parameter in this connection relates to
18 the -- whether or not the pipe is being operated towards
19 the upper limits of the specificied minimum yield
20 strength. In other words, isn't it more important not
21 to ask what pressure it is being operated at but whether
22 or not say it's being operated at 80 percent specified
23 minimum yield as opposed to 69 percent.

24 A Well there's would be
25 operating at 72 percent, which would be by the American
26 code.

27 Q Yes, that's what I understand.
28 They're at 72 percent of specified minimum yield strength
29 and I understand that Foothills proposed to be at 69.4
30 percent?

1 A 69 anyway, that is
2 correct.

3 Q I see. 69, about three
4 percent difference.

5 I believe sir we were discussing
6 how it was Foothills concluded that its pipe would be
7 able to arrest a propagating ductile fracture and as
8 I understood from Mr. Wetterberg, the design is based
9 upon the application, the Battele hypothesis and this
10 underlies your opinion that the pipe will operate in
11 this way, is that correct, Mr. Wetterberg?

12 WITNESS WETTERBERG:

13 A Yes.

14 Q Now when one is proposing
15 to use a pipeline such as the Foothills one that is at
16 higher pressures and operating at higher pressures than
17 previous pipes with which there's been experience in
18 North America, do I take it that if you don't have a
19 hypothesis to determine for you the behaviour of the
20 pipe in arresting fractures, that it's necessary to do
21 burst tests of the type we were discussing earlier this
22 evening, that were carried out by Battele?

23 WITNESS HUSHION: A Well I don't know that
24 it's necessary. It's one method of proving your
25 hypothesis I suppose or proving the parameters that
26 you have in the pipe.

27 Q What other ways would there
28 be?

29 A Well I suppose you would
30 have operating history too, on operating systems. It

1 would be another method. Your historical proof would
2 be probably as good as any and maybe in some cases
3 better than some of these burst tests. We seem to put
4 so many variables into the burst tests sometimes it's
5 very difficult to understand what the outcome really
6 is.

7 Q I suppose operating
8 history helps you to some degree but its. limited
9 because the experience in other pipelines deals with
10 different pressures and different operating conditions,
11 for example, not in a permafrost environment.

12 A Well it's true, this is
13 one of the points that we're trying to make.

14 Q Well, has Foothills
15 conducted full scale burst tests on the pipe that it
16 proposes to use?

17 A No, we have not as yet.
18 But we do have, as we pointed out, some pipe on order
19 which is presently being made and we will be at least
20 installing exactly the pipes that we intend to use
21 in the North.

22 Q By installing it, I take
23 it you're referring to that part of your evidence that
24 dealt with putting some of that pipe into service on
25 the Alberta Gas Trunk Lines Systems?

26 A That is correct.

27 Q That would be in Alberta
28 somewhere?

29 A We will be installing it
30 on the Alberta Gas Trunk Line.

1 Q That wouldn't be
2 operating at 1250 pounds per square inch gauge?

3 A Not in its operating
4 form, no.

5 Q Would it be operating
6 at 69 percent of its specified minimum yield strength?

7 A It would have to operate
8 at 1250 pounds in order to do that.

9 Q I see.

10 A It would be somewhat less.

11 Q Somewhat less than that.
12 I see.

13 A But at least would under-
14 go the testing parameters that we would use before we
15 install it. We do other physical tests such as bending
16 and we even have some other considerations in mind that
17 we're thinking about.

18 Q I was interested
19 specifically in the burst tests, sir. Does Foothills
20 have any plans to have its pipe undergo burst tests?

21 A We don't have any
22 definite plans as yet but we are doing some considerations
23 in the matter of -- perhaps where we might conduct
24 these tests and what manner we might go about it.

25 Q I see.

26 Mr Wetterberg, perhaps you
27 would be the one who would be most closely involved
28 with this. I was wondering whether or not Battele
29 has advised you say in the last six months or so that
30 the Battele hypothesis which would be hoped would predict

1 the pipe behaviour of the proposed Foothill pipe, is
2 applicable to this pipe. Do you have any advice from
3 them on that point?

4 WITNESS WETTERBERG:

5 A We have not had any
6 advice from Battele that it is not applicable.

7 Q Nor any advice that it
8 is?

9 from
A Only/interpretation of
10 their published data.

11 Q And by that are you
12 referring to the burst tests that were conducted on
13 behalf of Arctic Gas?

14 A No, I'm referring to
15 perhaps the data that was published and released as
16 members of American Gas Association, Alberta Gas
17 Trunk Line being a member and having access to test
18 data.

19 Q Would one of the documents
20 that you're referring to be a report of Battele's
21 Columbus laboratories entitled Fracture Initiation
22 Propagation and Arrest by a W.A. Maxy, in November 1974?

23 A I'm not sure on that.
24 I'm not aware of what paper you're speaking of.

25 Q Well I can show you my
26 copy. I understand that it's found in the fifth
27 symposium on line pipe research, published by the
28 Pipeline Research Committee of the American Gas
29 Association. You have that?

30 A Yes. That's referenced in

1 our application as being a reference document we have
2 used.

3 Q Yes, I believe in your
4 application you state that you have used the theories
5 in Battele's paper, Fracture Initiation Propagation
6 and Arrest of November, 1974 to evolve the conditions
7 of fracture control. I want you to look at the
8 section beginning at page J-25 and continuing to page
9 J-30 of that report. Do you have a copy of it with
10 you?

11 A No, I'm sorry. we
12 don't.

13 Mr. Marshall, if this question
14 or line of questioning is going to involve calculations
15 I would
16 /re-direct the question perhaps to Mr. Shelton to
17 respond to.

18 Q No, there is just one
19 short comment in the report that I wanted you to
20 react to if you would. At the end of the last paragraph,
21 the paper states, "Until a consistent and satisfactory
22 correlation is found for these materials, that does
23 predict full scale behaviour, it is impossible to
24 accurately specify the toughness requirements for these
25 materials."
26
27
28
29
30

1 A Excuse me, no, J25?

2 Q J30, last paragraph, it
3 is on page J30, it's the last concluding sentence, just
4 ahead of the section entitled "References". You found
5 the sentence that I've read in the record?

6 A Yes, I'm not sure without
7 reading and studying this entire document what these
8 materials are referring to.

9 Q Well perhaps sir, you
10 could take time to do that and perhaps advise us through
11 your counsel when you have done so. I suggest to you,
12 sir, that that statement certainly casts doubt on the
13 validity of applying the Battele fracture arrest
14 theories to the Foothills line pipe, and I want to know
15 whether or not you agree?

16 MR. HOLLINGWORTH: Well
17 obviously the witness can't comment on that until he
18 -- he has asked for the opportunity to read it at some
19 length.

20 MR. MARSHALL: Well I'm just
21 spelling out what it is I wanted him to comment on.

22 MR. HOLLINGWORTH: Well I
23 realize that, Mr. Marshall.

24 What exactly did you anticipate
25 the form of comment being, and when did you anticipate
26 it, Mr. Marshall, if I might clarify that?

27 I mean I don't expect that
28 Mr. Wetterberg is going to be able to read over the
29 entire document in the next five minutes.

30 MR. MARSHALL: Well I think

1 it gets down to this. The panel have indicated that
2 they are relying upon the Battele hypothesis to support
3 their opinion that the specifications of the pipe will
4 arrest a propagating ductile fracture, and I'm suggest-
5 ing that the very report they say they are relying upon,
6 casts doubt on that whole proposition, that whole
7 opinion, and all I'm asking him to do is to tell me
8 whether or not that's so.

9 Now, as to when -- how long
10 it takes him to read the report, I'm sure that as soon
11 as he's had an opportunity to reflect on it, he will
12 give us an answer.

13 MR. HOLLINGWORTH: Well are you
14 requesting that he give you this answer while this panel
15 is still on the stand, or that he submit it in a written
16 form in a week from now, or that he be recalled at a
17 later date? What exactly are you suggesting?

18 MR. SCOTT: This panel,
19 presumably, Mr. Commissioner, will be here tomorrow
20 morning. If not on the stand, at least available.

21 THE COMMISSIONER: I think
22 they will still be on the stand tomorrow morning.

23 MR. HOLLINGWORTH: I'm sure
24 they will, sir, but that's a very thick document Mr.
25 Marshall has produced. I just want to know if he's
26 expecting the panel to read that over between now and
27 tomorrow morning and comment on it tomorrow morning.

28 MR. MARSHALL: Well sir, it's
29 a 30 page document, which the witness said that -- or
30 the application says has been relied upon by Foothills

1 and the witness has said it's one of the documents upon
2 which he relies in support of his evidence. I don't
3 see what the difficulty should be.

4 MR. HOLLINGWORTH: I'm just
5 asking what you expect, Mr. Marshall, that's all.

6 THE COMMISSIONER: Well, let's
7 settle this by saying that we'll be sitting again at
8 9 in the morning, and if Mr. Wetterberg or any of his
9 colleagues are in a position to do so, they will comment
10 on this document at that time. IF they are not in a
11 position to do so, then they are not in a position to do
12 so, and they will then let us know when they can.

13 MR. HOLLINGWORTH: That's fine.

14 MR. MARSHALL:

15 Q I probably handed the
16 panel, along with the report, one of my pages of ques-
17 tions.

18 THE COMMISSIONER: Don't give
19 it back.

20 MR. MARSHALL:

21 Q On page 2 of your evi-
22 dence, Mr. Hushion, in answer to question 6, you make
23 the comment that all of the 42 inch pipe required by
24 Foothills can be manufactured in Canada.

25 THE COMMISSIONER: Excuse me
26 a minute.

27 MR. MARSHALL: Yes, sir.

28 THE COMMISSIONER: I want to
29 listen to you and I got into this other -- I think we
30 will make a fresh start.

Hushion, Wetterberg
Shelton, Holtsbaum
Cr. Exam. by Mr. Marshall

1 MR. MARSHALL: All right.

2 Q Mr. Hushion, you're aware
3 that in the Arctic Gas proposal it's intended that there
4 will be some 42 inch, some 36 inch and some 30 inch
5 pipe as part of the project?

6 WITNESS HUSHION:

7 A Is the 42 inch the leo
8 from the delta to the Travaillant Lake Junction?

9 Q Well there's alternatives,
10 yes.

11 A I'm aware that you have
12 just recently changed the lower part from Caroline to
13 Empress to 48 inch.

14 Q Well to be precise, there
15 is, as I understand it, there's 281 miles of 36 inch
16 pipe; 15 miles of 30 inch pipe, and as you point out,
17 there is an alternative of 42 inch pipe on the delivery,
18 on the supply laterals, right.

19 What I wanted to know, sir,
20 was whether or not in your view that pipe would be
21 readily available in Canada?

22 A The wall thickness of
23 the 42 inch is what, Mr. Marshall?

24 Q 640.

25 A That would be available
26 . in Canada, at the same single mill.

27 Q And the 36 inch pipe, I
28 understand, has a .540 wall thickness grade 70 pipe?

29 A And that would then be
30 available from two pipe mills.

1 Q And the 30 inch .45 inch
2 wall thickness grade 70 pipe as well?

3 A Two or more, yes.

4 Q Sir, on page 3 of your
5 evidence, part of answer 6, you state "In our judgment
6 the effectiveness of these proposed crack arrestors
7 has not to date been established and proven". What I
8 am interested in very briefly is this, sir. There has
9 been evidence given by Mr. Holmberg as to his inter-
10 pretation of the results of the various burst tests,
11 and that testimony is in evidence before the Inquiry,
12 and I've had a brief discussion with you about crack
13 arrestor tests that were done by United States Steel
14 in a paper that we were discussing before the supper
15 break .

16 A Yes.

17 Q Those being the sources
18 of information that were available to me. Now, I was
19 wondering whether or not Foothills had other sources
20 of information available to it, on which it reached the
21 opposite conclusion from that testified to by Mr.
22 Holmberg?

23 A No, I think that's just
24 the point, Mr. Marshall. There is a lack of conclusive
25 evidence on and the use of arrestors.
26
27
28
29
30

1 Q In other words, it's
2 a difference in professional opinion. Mr. Holmberg is
3 satisfied on the basis of the evidence he has seen
4 and you're not satisfied on the same evidence?

5 A Most certainly not.
6 I think that it's been very limited evidence or proof
7 and I think even in looking at the conclusions of your
8 report, that the A.I.S.I. produced, that they themselves
9 claim that further work is certainly needed. It's a
10 possible means but there is by no means conclusive
11 evidence that they be satisfactory.

12 Q I guess what I'm most
13 interested in, sir is whether or not you're both making
14 the judgment on the basis of the same data?
15 Or whether you have something additional that you're
16 basing it upon?

17 A As I said before, there's
18 nothing additional to base it on, except some very
19 limited evidence.

20 Q This was dealt with also
21 by Mr. Holmberg in his evidence, but it's true, is it
22 not sir, and you would agree with him, that the use of
23 crack arrestors in other engineering applications is
24 hardly novel. They've been in use for a number of years
25 in various types of applications?

26 A Well I've certainly been
27 told about them being used in the aircraft industry but
28 I think that is a far cry from the pipeline industry
29 and certainly in the permafrost and low temperature
30 pipelines.

1 We might add that there are
2 numerous problems created with crack arrestors that
3 have not been investigated as yet. There's a concern
4 for the discontinuity. if you were to put one of these
5 straps on, as compared to a straight line of the pipe,
6 and the stresses that are involved there, but whether
7 it's welded or not welded, that is the ends of the
8 strap, and there has been no work done in this area.

9 Q Well that's precisely
10 the point isn't it sir. You expressed the opinion that
11 they may be dangerous and imperil the pipe and as I under-
12 stand it, the concern you've expressed, for example, about
13 stress concentrations is something that Foothills hasn't
14 researched. Dr. Glockner is about to be doing some
15 work on this but he's still setting up his tests.
16 You don't have any test data on that?

17 A No we don't have any
18 either.

19 Q So it's just a possibility
20 at this point, until you have some verification through
21 test data --

22 A Well I think this is the
23 whole thing. We're saying that you don't want to just
24 inadvertently put something into a system that hasn't
25 been fully tested and proved.

26 Q But at least it hasn't
27 been tested by Foothills?

28 A Or anyone else.

29 Q To your knowledge.

30 A To my knowledge.

1 Q Sir, just a point of
2 clarification in answer to the question 7, you are making
3 reference to previous standards in pipe. The particular
4 statement is 48 inch/^{as}proposed by CAGPL because of its
5 greater change from any previous standard, may present
6 major problems. What I was interested in sir, is
7 what you considered to be the previous standards, of
8 specification for pipe. What is it you have in mind?
9 What is it you're taking as the base for making that
10 statement?

11 A Well I think that there
12 has been no 48 inch high pressure gas pipelines
13 installed in Canada as yet. There are no pipelines
14 of a wall thickness that approaches .720. We have,
15 and I believe -- well I retract, I think Trans Canada
16 may have installed some grade 70 pipe, but beyond that,
17 Alberta Gas Trunk Line is the only one that has
18 and I believe some limited amount by Trans Canada Pipe
19 Line, and operating at the same time at 80 percent
20 stress level and 1680 pounds. I think these are
21 deviations from the standard.

22 Q Well what is the standard,
23 that's what I'm getting at. You're listing a bunch
24 of factors which you say/^{are}deviations, but what is the
25 standard? What do you consider to be the standard?
26 Alberta Gas Trunk Line?

27 A Well it certainly is that,
28 a high pressure system that ties to Trans Canada.
29 It operates at the same general pressure that we do.
30 It's wall thickness is what we've said, approaches the

1 standard, our maximum as Mr. Wetterberg has pointed out,
2 is .503 which is not too far from what we're advocating
3 for our system in the Arctic.

4 THE COMMISSIONER: Mr.
5 Hushion, at page three, question 7, the answer you gave,
6 at least you gave this answer, I believe that you were
7 talking about the Arctic Gas pipe --

8 A Their proposed --

9 Q Specification.

10 A Yes.

11 Q "I believe that 48 inch
12 grade 70 pipe with .720 inch wall thickness would
13 test the limit of current pipe manufacturing technology
14 and capabilities, and is in an area unproven in terms
15 of pipeline operating history." When you say in an
16 area unproven, are you talking about a pipeline
17 running through a permafrost area or are you talking
18 about something else?

19 A No, I meant in the realm
20 of these specifications.

21 Q So area was a reference
22 to --

23 A Not a locality.

24 Q I understand that. but
25 what is it then a reference to. What other specifications,
26 apart from the wall thickness, the diameter, did it
27 refer as well to the pressure at which the gas would
28 be flowing through the pipe?

29 A Well it would be the
30 combination, particularly of the pressure and the stress

1 levels of the---

2 Q Well when you attack
3 the Arctic Gas pipe specifications, what is it that
4 you're saying that the .720 inch wall thickness has
5 never been tried before in Canada?

6 A Yes.

7 Q Now, you say never before
8 in Canada, has gas been run through a pipeline at the
9 pressure that Arctic Gas proposes to use to obtain
10 the efficiencies of volume, of large volumes that they
11 wish. Now that's another point is it?

12 A Right, there certainly
13 aren't any pipelines in Canada and I doubt that
14 there are very many in the world.

15 Q Are there any in the
16 world?

17 A Well I can't be certain,
18 but it isn't prevalent to have that degree of pressure.
19 There are some that have an increased wall thickness
20 and perhaps operate at a higher pressure but it is
21 very rare that you would have all three in one combin-
22 ation, that is the diameter of the pipe, the wall
23 thickness, the grade and operating at 80 percent at
24 the same time which gives you your 1680 pounds pressure.
25 I daresay there are --

26 Q I'm anxious to follow
27 this, and I think, in fairness to Arctic Gas they
28 should know exactly -- maybe they do know, but I don't.

29 A We have tried very hard
30 to investigate this, particularly in Europe because

1 were quite aware of what's in North America.
2 Certainly there are none anywhere near that in the
3 United States.

4 Q You say the combination
5 of the diameter, the wall thickness, the --

6 A The grade.

7 Q The grade of the steel?

8 A Yes.

9 Q And the pressure.

10 A And the pressure and the
11 80 percent stress levels, because I believe that
12 Canada is the only country that is allowed to operate
13 at a .8 factor following successful tests in situ
14 of your pipeline.

15 Q And you say they can't
16 get this pipe in Canada anyway, at least you say they
17 won't be able to get this pipe in Canada, that's
18 what you're saying?

19 A No, I didn't say that.

20 Q Forgive me.

21 A We're saying that there
22 is only one pipemill at the present time that could have
23 the capabilities of doing this, but until such time as
24 it is run through some production runs, we're not sure
25 of that. We believe that this will, as I said, test
26 the limit of that particular pipemill.

Hushion, Wetterberg,
Shelton, Holtsbaum
Cr. Exam. by Mr. Marshall

1 Q Forgive me, I just want
2 to make sure I understand what the basis of the challenge,
3 so to speak, to Arctic Gas' pipe specifications --

4 A We just recently, Mr.
5 Commissioner, tried to purchase a mile of this pipe
6 to Canadian Arctic Gas specifications from the Steel
7 Company of Canada --

8 Q You did?

9 A -- and we were unsuccessful
10 in our attempts. However, we did manage to get 10
11 miles from two suppliers of the pipe that we are pro-
12 posing to our specifications.

13 Q Of the 42 inch pipe?

14 A Yes.

15 Q Well you mentioned that
16 this afternoon, somebody did.

17 MR. MARSHALL:

18 Q Mr. Hushion, what would
19 the 48 inch pipe be used for by Alberta Gas Trunk Lines,
20 or was it Foothills?

21 A It would have been Alberta
22 Gas Trunk Lines since we don't have any system as yet,
23 unfortunately to install any pipe, but we would have put
24 it into our system at some location. This is something
25 that I think in our particular company we have been or
26 we would like to consider very progressive in things
27 that we have done in the past, and we would like to have
28 this pipe. It would be for the good of the industry if
29 the mill was able to make a production run and supply
30 this pipe. Actually, it would have been to CAGSL's

1 benefit. Perhaps to our detriment.

2 Q As I understand it, Trunk
3 Lines over the years have been fairly progressive in
4 moving up to bigger pipe sizes. They are, as I think
5 you mentioned, pioneers in use of grade 70 pipe, for
6 example, and they have been --over the year they have
7 had--

8 A Yes, grade 70, we were
9 the first to use 42 inch when it fitted the situation,
10 and we used automatic welding the first time, in fact
11 I guess we put 42 inch and X70, X70 at that time, it's
12 now grade 70, and installed it with automatic welding
13 all at one time, 75 miles.

14 Q And lately you have been
15 thinking of moving up to 48 inch as well?

16 A Well we are always
17 thinking. If it fits the situation at the proper
18 time, yes we would do that, if the economics are there.

19 Q Sir, I wanted to ask you
20 a little bit about unfamiliar off-shore suppliers of
21 pipe.

22 THE COMMISSIONER: Where are
23 they referred to?

24 MR. MARSHALL: This is at the
25 bottom of page 3 in answer to question 7, sir.

26 Q What I want to suggest
27 to you, sir, is that the off-shore suppliers of pipe
28 really aren't unfamiliar. They are well known to
29 pipeline companies, including Alberta Gas Trunk Lines
30 and Trans-Canada and Westcoast, is that not so?

1 A Yes, sir, they are well
2 known by name, but I don't think other than Westcoast,
3 that certainly Alberta Gas Trunk Line has not, when I
4 was with that company, and I don't believe that Trans-
5 Canada Pipelines has any German, Italian or even Japan-
6 ese pipe in their system.

7 Q You're not sure about
8 that?

9 A I feel quite certain.

10 Q Alyeska does.

11 A Pardon me?

12 Q Alyeska does.

13 A Alyeska, yes --

14 Q A lot of Japanese --

15 A -- in fact their total
16 pipe, 100 percent Japanese pipe.

17 Q My information is, sir,
18 that the off-shore pipe suppliers really so far as the
19 industry are concerned, are very well known indeed and
20 not only that, but they are considered to be a very
21 reliable source of supply of very high quality pipe.
22 Do you not accept that?

23 A I don't have any actual
24 experience with German or Italian pipe. We had a very
25 limited with Japanese, I think we bought some 16 inch
26 from them many years ago, about 1964, some 20 miles.
27 It's the only pipe that isn't Canadian that is in our
28 system, but yes, we think the Japanese have an excellent
29 reputation.

30 Mind you, you must consider

1 too that what we are talking about is in the realm of
2 the new things that your pipe specifications are looking
3 at. I don't think that there's much background or
4 history of anyone who would be an unknown quantity in
5 looking at as I say once again, the 48 inch grade wall
6 thickness, pressure, at the stress levels.

7 O Well I understand there's
8 been a mission to Japan, including representatives from
9 Arctic Gas, and they found that there is very substant-
10 ial capacity in the Japanese mills, and they had the
11 capability of manufacturing pipe larger than 48 inch.

12 A Yes, I understand that --

13 Q Are you aware of that?

14 A -- I've seen some of
15 their brochures where they say 56 inches. It would be
16 a terrible thing to have this pipeline built with
17 Japanese pipe though, when it can be built and con-
18 structed with all Canadian pipe, as the Monday 1 o'clock
19 witnesses attested to.

20 THE COM MISSIONER: Well, what
21 are you going to say to that?

22 MR. MARSHALL: Well I have
23 Japanese friends, sir -- I think I will just let it
24 pass.

25 A I have some too.

26 Q You also talk about, at
27 the same page, at the bottom of the page in answer to
28 question 7, about unforeseen fluctuations in pipe costs
29 from off-shore suppliers. I was wondering if you could
30 tell me something about that, sir? What have these

1 unforeseen fluctuations been?

2 A Well I am particularly
3 referring to Japanese pipe here. We, on occasion, have
4 obtained quotations from them, and I think this is,
5 the word, common gossip, but it is the experience of
6 other purchasers of pipe, that there's a tendency for
7 their prices to fluctuate as fits the demand. If you
8 are in short supply and in need of something, their
9 prices rise quite rapidly. If it's very competitive,
10 then they will reduce their price substantially.

11 In other words, where in Canada
12 we -- the pipe mills, but Stelco actually publishes a
13 price and many of the others follow, and this does
14 maintain a reasonable and understandable pattern, but
15 you just go for quotations from the off-shore suppliers,
16 particularly the Japanese, and there's a great tendency
17 for their prices to fluctuate.

18 Q Well, we will get back
19 to the Canadian mills in a minute, sir, but wouldn't
20 you agree with me that the fluctuations in price of off-
21 shore pipe, both are up and are down?

22 A Yes, they have, yes.

23 Q Depending on such factors
24 as competition and whether or not there happens to be
25 idle capacity?

26 A Probably more in competi-
27 tion rather than the idle capacity.

28 Q This isn't something
29 that Foothills has been studying, I take it?

30 A No, we're not interested

Hushion, Wetterberg
Shelton, Holtsbaum
Cr. Exam. by Mr. Marshall

1 in off-shore pipe.

2 Q Well, tell me what's been
3 your recent experience with Canadian pipe suppliers?
4 Have you found their price quotations in the last year,
5 say, to be pretty steady, or pretty steadily upwards,
6 or fluctuating up and down?

7 A Well I think we follow
8 the trends in pipe and we are continually purchasing
9 pipe, and I think like everything else the prices have
10 been rising, yes.

11 Q Could you give me some
12 indication as to what the price quotations you're
13 getting on the pipe Foothills proposes to use, have been
14 doing over this period of time since last fall when
15 Foothills got under way, or do you have a range of
16 various quotations you have obtained at various times
17 as to your pipe costs?

18 A Yes, we certainly have,
19 yes.

20 MR. HOLLINGWORTH: Mr. Marshall
21 is well aware, I would think, Mr. Commissioner, that
22 the prices quoted by steel mills are strictly confiden-
23 tial to those steel mills and we are hardly in a
24 position to relay those to him just as Stelco or Arctic
25 Gas would in no way relay the prices to us on their
26 pipe.

27 MR. SCOTT: Surely, Mr.
28 Commissioner, we are all Canadians here. We are
29 talking about Canadian pipe, why can't the figures be
30 disclosed?

Hushion, Wetterberg
Shelton, Holtsbaum
Cr. Exam. by Mr. Marshall

1 MR. HOLLINGWORTH: I disagree
2 with my friend, Mr. Scott. We are in no position to
3 disclose something that Stelco wants withheld.

4 THE COMMISSIONER: Well --

5 MR. MARSHALL: Perhaps we
6 could achieve a compromise. I must say I think Mr.
7 Scott is right and the witness has put it in his testi-
8 mony, he is making a point about those unreliable
9 foreigners, whereas we good Canadians, but couldn't we
10 do it on the basis of a percentage fluctuation of
11 change?

12 THE COMMISSIONER: He didn't
13 say unreliable, I thought he said unfamiliar off-shore
14 suppliers.

15 MR. MARSHALL: Oh, I'm sorry.

16 THE COMMISSIONER: I didn't
17 even hear him say that, all I read was off-shore
18 suppliers, but you kept saying --

19 MR. MARSHALL: No, he has used
20 the term "unfamiliar off-shore suppliers" in the second
21 line in the last paragraph on page 3.

22 MR. HOLLINGWORTH: I will
23 withdraw my objection. I thought the thrust of Mr.
24 Marshall's question was going to the exact pipe that
25 is being asked to be quoted.

26 MR. MARSHALL: Well I am
27 interested in the question that Mr. Hollingworth
28 doesn't want answered, but perhaps we can get at that
29 some other day, but I think it would suffice if I
30 could be provided with some information as to the

Hushion, Wetterberg,
Shelton, Holtsbaum
Cr. Exam. by Mr. Marshall

1 percentage changes in the prices that are being quoted
2 to Foothills for its pipe by the Canadian mills, over
3 the last period of time during which they have been
4 getting these quotations.
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

1 THE COMMISSIONER: That
2 sounds reasonable.

3 MR. HOLLINGSWORTH:
4 I have no objection to it.

5 THE COMMISSIONER: Maybe we
6 could take a five minute break and stretch our legs
7 and anyone who wants coffee can scurry into the coffee
8 shop.

9 (PROCEEDINGS ADJOURNED)

10 (PROCEEDINGS RESUMED PURSUANT TO ADJOURNMENT)

11 MR. MARSHALL:

12 Q Mr. Hushion, you mentioned
13 that you had tried to order some pipe of the Arctic Gas
14 specifications from Stelco and weren't able to get any.
15 When was it that you attempted to do this sir?

16 A I suppose a month ago.
17 Approximately.

18 Q And what reason were you
19 given for the refusal of your order?

20 A Let me just think a minute
21 here. They told us that the CAGPL Spec was still a
22 tentative Spec, and there were some things that they
23 needed to work out with CAGPL.

24 Mr. Wetterberg informs me that
25 they had still not assessed all of the data, and that
26 they were still uncertain themselves as to their
27 ability to make the run. They had some internal
28 problems to work out themselves.

29 Q Who was it that you got
30 the information from sir?

1 A Well it was -- I don't
2 know the people by name but it was -- our Alberta Gas
3 Trunk Line Purchasing Department in discussions with
4 Stelco sales representatives. I'm informed, a Mr
5 Hopkins.

6 Q Mr. Hopkins.

7 Now Mr. Hushion you say on page
8 two in answer to question five, or part of the answer
9 to accomplish this the operating pressure in the pipeline
10 has been reduced from 1440 to 1250 pounds per square inch.
11 Do I take it that Foothills initially intended to
12 operate at 1440 and for metallurgical reasons has
13 decided to reduce the pressure?

14 A No, we at no time intended
15 to operate at 1440 pounds. In working out the notch
16 toughness requirements we found that the wall thickness
17 that we required and in using that, with what the
18 pipe actually would be allowed to operate at gave us
19 the 1440 pounds?

20 Q Well it's the use of the
21 words reduced from 1440 to 1250 that give me some
22 trouble. That seems to suggest that you started at one
23 thing and then you reduced it to another. But I
24 misunderstand that, do I?

25 A Yes, it really is the
26 other way around. The pipe itself being capable of
27 operating at 1440 pounds but our deciding that we
28 wouldn't operate at that pressure.

29 Q This is because of the
30 application of the Battele hypothesis to your pipe

1 specifications?

2 A That is correct.

3 Q Now you go on to say
4 consistent with pipe having a maximum notch toughness
5 available from Canadian pipe manufacturers, did the
6 capability of the Canadian pipe manufacturers to meet
7 the notch toughness requirements come first or was this
8 the controlling parameter if you like?

9 A Yes, it is one of them.
10 This has been evolving, as you're well aware, this
11 whole business of sheer fractures has been going on
12 since 1969 so in discussions with manufacturers,
13 you can define it, this was about the limit of their
14 capabilities.

15 Q What was? What
16 notch toughness are you referring to?

17 A It's about 84 pounds maybe 85.

18 Q And is that your under-
19 standing of the state of the art now in Canada?

20 A Yes that is still
21 our understanding.

22 Q If I understood the evidence
23 one of your previous panels who were testifying this
24 week before the Inquiry, the optimization studies that
25 were done on behalf of Foothills indicated that they
26 would get the best economics for the volumes of gas
27 that Foothills proposes to transport, with 42 inch pipe,
28 operating at 1440, that is 80 percent of the specified
29 minimum yield strength, that is true, is it?

30 A That is true.

1 Q And for the volumes of
2 gas that you have to work for, that would be the best
3 case, if you didn't have this metallurgical problem
4 at those pressures?

5 A That is correct, we have
6 penalized ourselves.

7 Q And the penalty is some
8 15 to 20 percent as I understand your reduction in
9 your throughput?

10 A I would accept that, yes.

11 Q Mr. Hushion, do you
12 have any information as to what the capital costs would
13 be in the event crack arrestors were installed on the
14 Foothills line assuming, which I'm sure you may not
15 agree with, but I'll ask you to assume that the diffi-
16 culties you see for crack arrestors are found not to
17 be difficulties after the research is done. Have you
18 got any estimates of what it would cost you to put
19 crack arrestors on?

20 A No, we haven't, we have
21 no idea of any design as yet. so it would be very
22 difficult to cost anything out.

23 Q Well it would follow then.
24 I guess that you're not against the use of crack
25 arrestors because of cost considerations. You simply
26 don't have a position on their cost?

27 A We don't have any
28 confidence in their ability.
29
30

Hushion, Wetterberg,
Shelton, Holtsbaum
Cr. Exam. by Mr. Marshall

1 Q But it's the cost aspect
2 that I'm particularly interested in. Do I take it you
3 have no information as to what the cost would be?

4 A We have no information as
5 to what the cost would be.

6 Q Yes. Mr. Wetterberg, I
7 was interested in your discussion about pipe mills in
8 Canada, and I was wondering if the Calgary and Edmonton
9 mills of IPSCO could produce pipe to Foothills' speci-
10 fications for this project?

11 WITNESS WETTERBERG:

12 A From the Calgary mill and
13 the Edmonton mill?

14 Q Yes sir.

15 A Yes, sir, they can.

16 Q That's the --

17 A Those two mills are form-
18 ing mills, they are pipe mills. The properties that
19 are required in the pipe will be manufactured in the
20 scalp material, so it's back in the basic steel mill
21 where those properties are introduced in any materials
22 that are used for the pipe.

23 Q They don't have any
24 difficulty or problem with the thickness?

25 A We are told that they do
26 not foresee any problem with the thickness of the
27 material. They are in the process right now of having
28 rolled scalp material of the .540 grade 70 for fabricat-
29 ion into 42 inch pipe. As yet, they have not formed
30 the pipe, or at least we have not had a response back

1 from the mill of their success at forming it.

2 Q I believe you used the
3 term that they have expressed their opinion that they
4 will be able to do it, is that correct?

5 A That's correct.

6 Q And I take it you say that
7 because they're just in the process now of actually
8 forming this pipe?

9 A That's correct.

10 Q And the specifications you
11 presented to them, I take it, would have been the speci-
12 fications for pipe that are contained in the Foothills'
13 application?

14 A That's right.

15 Q Which mills will use
16 scalp and which will use plate?

17 A The Stelco mill will use
18 plate which is a spiral mill; the Camrose scalpel
19 plate will use plate mill or plate from that plate
20 mill; the Regina spiral will use coiled material;
21 the Edmonton mill will also use coiled material;
22 the Calgary mill will use plate material.

23 Q Thank you. On page 7,
24 in answer to question 15, you say the only unique or
25 different aspect of the proposed Foothills pipeline is
26 the length of the line transporting chilled gas and the
27 environmental considerations which have been taken into
28 account.

29 Now, it's clear we are talking
30 about metallurgical considerations, are we not?

1 A That's correct.

2 Q I suggest, sir, that
3 the notched toughness for Foothills pipe really isn't
4 conventional?

5 A That is part of the
6 environmental considerations being taken into account,
7 was to ensure that we had adequate notched toughness
8 for the environment that was involved.

9 Q I see, so you are includ-
10 ing notch toughness among the environmental considerat-
11 ions?

12 A Yes.

13 Q And would the same apply
14 to transition temperatures?

15 A Yes, sir.

16 Q And I'm instructed that
17 conventional production techniques couldn't be used
18 inasmuch as there would be controlled rolling or rare
19 earth treatments, is that right?

20 A That has become, in the
21 last three years, a conventional technique.

22 Q And it's conventional to
23 use the Batteale hypothesis in C sub-V 100 to specify
24 Charpy toughness to design a pipeline?

25 A No sir.

26 Q Is this being done for
27 the Foothills pipes?

28 A Yes sir.

29 Q Well really, sir, I just
30 make the point because it seems to me you are really

1 overstating the situation, aren't you? There are a
2 number of aspects of even Foothills' pipe as contrasted
3 with Arctic Gas, that really are different from what's
4 been done before?

5 A No sir, I disagree with
6 you.

7 Q You disagree with that?

8 A Yes.

9 Q On page 8, in answer to
10 question 15, you make reference to a pressure test in
11 the pipe mill to a minimum of 300 PSI greater than the
12 pipe's operating pressure. I was just wondering, sir,
13 whether that was 300 PSI more than 1,250 or 1,440? I
14 should just add, I think, that the circulated evidence
15 said to a minimum of 300 PSI greater, but I think you
16 changed that in your direct evidence. Perhaps you could
17 deal with that first.

18 A That's correct. If you
19 look at our specifications, we say that the mill test
20 pressure will be 95 percent, and if you use a 90 percent
21 test or a 95 percent test, that has an effect on what
22 the difference then would be between your test pressure
23 and your operating pressure.

24 The mill test at 95 percent
25 is 1,710 PSI, and if you subtract our operating press-
26 ure of 1,250 from 1,710, it in fact is 460 pounds, not
27 300 pounds. So we are being very conservative when we
28 say 300.

29 Q Well --

30 A If the mill is only

1 successful in testing to 90 percent, then it will
2 approach the 300. It would be approximately 300.

3 Q Well if you subtract the
4 300 from 1,770 which is the figure I see noted on page
5 16 in Mr. Shelton's evidence, then you come out with
6 1,470? What I'm interested in is whether or not you're
7 pressure testing with a view to 1,250 PSIG operation
8 or 1,440 PSIG operation?

9 A I think the entire line
10 has been pressured and tested to 1,440.

11 Q I have a little difficulty
12 following that then, sir, because I have understood the
13 thrust of Mr. Mirosh's evidence and the evidence of
14 this panel to be, that you don't think the pipe will
15 be safe at 1,440, but you are testing to that anyway?

16 A There's no reason why we
17 would not test it to 1,440.

18 Q I see. On page 8 in
19 answer to question 16, you make reference to AGTL's
20 use of 42 inch grade 70 line pipe. Is that of the
21 same specifications as that that which is proposed for
22 use by Foothills?

23 A No sir, the notch tough-
24 ness requirements are different.

25 Q And I take it it won't
26 be operated at the same pressures?

27 A No, sir, it won't.

28 Q Are the transition temper-
29 atures the same?

30 A No, sir.

Hushion, Wetterberg
Shelton, Holtsbaum
cr. Exam. by Mr. Marshall

1 Q You make reference in the
2 answer to question 17 on the same page, to AGTL pipe
3 with a 0.503 wall thickness, again 42 inch pipe. How
4 much of that pipe does AGTL have in its system now,
5 sir?

6 A I believe there is a mile
7 of that pipe.

8 Q Is that being used --
9 a mile?

10 A I believe so, I would have
11 to check that to be certain, but I recall now.

12 Q Can you tell me about the
13 percent of specified minimum yield strength that's
14 being operated at?

15 A I believe that was designed
16 for 80 percent. I do not know what it is operating at
17 presently. That would depend on what the line pack is
18 in the particular section that pipe is in.

19 Q WELL I understand that
20 in some areas there's a requirement that you drop below,
21 say, the Code limit of 80 percent of specified minimum
22 yield strength? I take it within compressor station
23 boundaries and perhaps near some settlements and so on,
24 and I was just wondering whether or not that particular
25 pipe was operating at lower pressures, and at a lower
26 percentage of specified minimum yield strength than the
27 rest of the system.

28 A It's line pipe.

29 Q It's line pipe?

30 A Yes, sir.

1 Q Could you give me some
2 figures as to the difference in the design temperatures
3 and the notch toughness requirements between that pipe
4 and what Foothills is proposing?

5 A Without having data in
6 front of me I couldn't estimate what the difference in
7 notch toughness is. The design temperature would be
8 plus 25 for that 503 wall, of course the Foothills
9 design is 0 degrees.

10 Q Right, well perhaps the
11 other figure, you could check and advise me through
12 your counsel.

13 MR. SCOTT: Mr. Commissioner,
14 I'm trying to follow this as well and I wonder if I could
15 interrupt either to ask a question or to ask Mr. Marshall to
16 ask so I could understand?

17 I understood the witness to say
18 that in answer to a question related to question 17,
19 that there was one mile of that pipe installed in the
20 AGPL system. Did I misunderstand or was that --
21 I'm not quite sure how that relates to the previous
22 answer in which there is reference to approximately
23 450 miles of 42 inch. Maybe I misunderstand all
24 together.

25 MR. MARSHALL: Well perhaps
26 I can help out by putting a question to the witness and
27 see if this clarifies it. Really what you're trying
28 to suggest here, Mr. Wetterberg is that it doesn't take
29 very much more for Alberta Gas Trunk Line through
30 Foothills to move up to the specifications of pipe
for the foothills system, because it's got all this

1 experience with 42 inch pipe but when you analyze it
2 really. don't you find that when you're talking
3 pipe of the same wall thickness or you say within ten
4 sheets of paper, you've only got a mile of it. And
5 the other 42 inch pipe, it's not of the same specification.
6 It's quite different pipe in terms of its notch
7 toughness and the transition temperatures and so on.
8 That's really the point I'm making. Does that help you
9 Mr. Scott.

10 MR. SCOTT: I haven't heard the
11 answers yet.

12 MR. MARSHALL: I haven't
13 either.

14 A The 250 miles of 42
15 inch grade 70 we have in our system encompasses all
16 thickness from 375 all the way up to 503. Our
17 design temperature is plus 25 on the Alberta Gas Trunk
18 Line System. The notch toughness requirements are
19 different. but they are different than those for the
20 Foothills system in that we have not specified previously
21 in previous years, 1971, 72 and 73, a foot pound
22 requirement .

23 Q You've now started to.

24 A Yes.

25 Q Just one other point sir.

26 . Could you tell me what pressure the main system of
27 AGTL is operating at?

28 A It varies from about 911
29 thousand to 934 , in that general area. We some have
30 some lines operating as high as 1250 pounds.

1 Q Would these be small
2 lines, small diameter lines?

3 A Yes, I believe that's a
4 10 or 12 inch.

5 Q In the large diameter
6 pipes, the 42 inch pipes, you don't have anything that's
7 over 911.

8 A 934.

9 Q Well then you're not up
10 near the upper limit of the range that you've quoted of
11 9 to 1200 PSIG as being the range for present pipelines?
12 You're down near the bottom end of that range?

13 A I wasn't only considering
14 Alberta Gas Trunk Line, there are some systems that
15 operate higher than ours.

16 Q Mr. Shelton, the slides
17 that you presented or the tables that were projected,
18 tables 1, 2 and 3, I had a question about table 3 which
19 was the incidence of operating ruptures on the AGTL
20 natural gas pipeline system. This followed two tables,
21 setting out statistics on American systems. I have
22 a couple of questions pertaining to them. First, I
23 note that the AGTL data contained on table 3 doesn't
24 talk about leaks, it only talks about ruptures. I was
25 wondering if you had some information on leaks?

26 WITNESS SHELTON:

27 A I don't think our company
28 records have been kept in sufficient detail to provide
29 comparable data on leaks as has been reported in the
30 American literature to OPS.

1 Q I see, so you don't have
2 that information?

3 A Not comparable
4 information.

5 Q I noted as well that you
6 didn't list the cause of the rupture as had been done
7 on the other tables that related to the data gathered
8 in the United States and I wondered if you had that
9 information as to those ruptures that you listed in
10 table three, which is part of Exhibit 253?

11 A Yes I can tell you what
12 the causes were. The reason I did not list them is that
13 I don't feel that the sample is large enough really to
14 draw conclusions as has been done in the American data
15 which considers a large number of ruptures. However,
16 the failures have resulted, three from material
17 defects, excuse me, four from material defects, and
18 two from what would be termed third party or outside
19 forces damage.

20 Q Sir, this question as to
21 the likely incidence of ruptures was discussed at some
22 length by Mr. Hurd who appeared as part of the
23 operations and maintenance panel that was called by
24 Arctic Gas and I was wondering whether or not you were
25 familiar with the evidence that he gave before the
26 Inquiry. I believe it was the middle of May. The
27 reference I had is that it began about page 5246 of
28 the transcript.

29 A No, I'm not familiar with
30 that.

1 Q Well as I understood his
2 evidence and I want to get a comment from you on it
3 sir, he indicated that while the statistical information
4 that one can gather such as that contained in the
5 tables that you presented, on the American statistics,
6 while such information can be gathered, you have to be
7 careful in its interpretation because such tables con-
8 tain a very wide range of pipe sizes, going right down
9 I think you mentioned to distribution systems with
10 operating within urban areas, and secondly that some of
11 these systems have been in service for a great length
12 of time and were put in using engineering criteria not
13 nearly as severe, strict, advanced as those that
14 pertain today. Do you generally agree with that?

15 A Yes.

16 Q Would it follow sir that
17 the likely incidence of rupture in a modern large
18 diameter high pressure gas pipeline would, in your
19 opinion, be markedly less than it would be having regard
20 to the industry wide experience in the United States?

21 A Yes, I believe it would
22 be.

23 Q And finally sir, the
24 note I have is that Mr. Hurd made reference to the
25 response to question 22, that Arctic Gas gave to the
26 pipeline application assessment group, it was stated
27 that the frequency of failure that might be expected
28 in the Arctic Gas pipeline, based on industry experience
29 is approximately one break every nine and a half years.
30 He was taking the whole of the proposed Arctic Gas

1 system and not just that part in the Northwest
2 Territories, and I think he went on to say that north
3 of the 60th parallel the likely instance of break
4 was even markedly less than that. I wonder if
5 you had an opinion on that sir?
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

Hushion, Wetterberg
Shelton, Holtsbaum
Cr. Exam. by Mr. Marshall

1 Q Have you done any studies
2 that would lead you to the same or a different conclus-
3 ion?

4 A Yes, I don't recall the
5 figures off-hand, Mr. Marshall, but I believe they are
6 in the same general area as that. It's really a stati-
7 stical analysis of the same type of data, depending
8 exactly on what data you use, I think that that is
9 accurate.

10 WITNESS HUSHION:

11 A I can verify that, Mr.
12 Marshall, if you wish. I read some data in our
13 correspondence that says a fracture one in ten years.

14 Q So you're in general
15 agreement with Mr. Hurd's evidence on this point?

16 A Yes.

17 Q I didn't want anyone to
18 get the wrong impression from your table 2, Mr. Shelton.

19 WITNESS SHELTON:

20 A Thank you, Mr. Marshall.

21 MR. SCOTT:

22 Is the point that Mr. Marshall was trying to
23 make, I don't understand -- there are not going to be
24 any ruptures but if there are, they are going to be
25 on somebody else's pipeline?

26 WITNESS SHELTON: Yes, they
27 will be on the Foothills' pipeline.

28 THE COMMISSIONER: I think
29 that this is as far as we are going to get tonight.
30

1 MR. MARSHALL: That last remark
2 was too much for you, was it?

3 MR. SCOTT: I was just
4 impressed by the reconciliation that appears to have
5 occurred between the two applicant companies at the
6 end----

7
8 THE COMMISSIONER: Well, we
9 will adjourn then until 9:00 tomorrow morning, and we
10 will sit tomorrow in the morning, the afternoon and the
11 evening, and there we are. So 9:00 o'clock.

12
13 (PROCEEDINGS ADJOURNED TO 9:00 A.M., THURSDAY,
14 SEPTEMBER 18TH, 1975)
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30

347
M835
Vol. 63

Mackenzie Valley pipeline inquiry:

Vol. 63 17 September 1975

3 1761 11467716 4

